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PROCEEDINGS OF THE SOCIETY

TWELFTH ORDINARY MEETING

WEDNESDAY, 19TH FEBRUARY, 1936

MAJOR-GENERAL SIR PERCY Z. COX, G.C.M.G., G.C.I.E., K.C.S.I., in the Chair

THE CHAIRMAN, in introducing the lecturer, said: It is a great pleasure and privilege to me to be taking the Chair for Sir Leonard Woolley to-night. He has addressed this Society before, and I expect you know all about him, but it is my pleasure and duty to tell you something of your lecturer. In the first place, you have in him a very distinguished man, not only as an archæologist, but in other spheres of life. Sir Leonard has been an archæologist for the last thirty years or more. He started as an assistant in the Ashmolean Museum at Oxford, and it was there, I imagine, that he came under the influence of that great scholar, David Hogarth, whose loss we so much deplored a few years ago. From there he went out to Nubia as member of an expedition which carried on excavation in that country for several years, from 1907 to 1912. After that he went to Anatolia as one of a party of young archæologists which included T. E. Lawrence, who was an assistant. They were there when the Great War broke out, and of course at the beginning of the war, when Turkey came in, we had to mobilize everyone we could who knew Turkish or Arabic. Such men were needed both in Mesopotamia and in Cairo, and Captain Woolley, R.F.A., as he then was, T. E. Lawrence, the present Lord Lloyd, and a galaxy of distinguished young men, formed what they called "the Arab Bureau," under General Clayton and Commander Hogarth, and they did most valuable intelligence work in connection with Turkish activities on the Mediterranean side, and later in connection with the Arab Revolt. While he was there, Sir Leonard went on intelligence work among the islands off the coast near Alexandretta, and the vessel in which he was travelling was blown up by a mine and about half of the company were drowned or killed. Sir Leonard and one or two others were rescued at the last moment before they actually succumbed. He was sent to a prison camp at Kastamuni for a couple of years. If you want the best popular account of the character and work of an archæologist in the field, you will find

it in a book he wrote during those years of his in a Turkish camp, called *Dead Towns and Living Men.* The archæologist's life is by no means all beer and skittles, nor all picking up objects of *vertu* and sending them to museums; it means the driving and handling of workmen and natives who are often very difficult to manage, and for all these years Sir Leonard Woolley has been on work of that kind. In 1922, after the war, he came out with an expedition to excavate at Ur of the Chaldees, and remained there until two years ago, when the expedition had to be wound up. But the results of their work are the magnificent collection of articles in the British Museum which anybody who has not done so ought to see.

The following lecture was then read :—

THE RACIAL ELEMENTS IN SUMERIAN ART HISTORY

By Sir Leonard Woolley, M.A., Litt.D.

I am dealing to-night with a subject which is rather intricate, but I hope not altogether uninteresting—the racial connections and origins of the art of the Sumerians. Recent discoveries have shown that the Sumerians developed an art extraordinarily important in itself, attaining a wonderfully high level, and the more historically noteworthy because it is the product of the earliest civilization of which as yet we have any knowledge. It developed in the lower valley of the River Euphrates, and in proportion as we admire the excellence of its achievements we must be interested in the people who produced it. Who were these people who lived in that distant and somewhat remote corner of the world, who could attain so high a level of skill, of human knowledge and accomplishment ? What was it in themselves that enabled them to produce such remarkable works of art at so early a period of time ? One answer is, I think, that they were a hybrid people. No nation, it is probably safe to say, has ever done anything much so long as it was pure-blooded. That is, of course, theoretical and a dangerous theory to hold in a modern world, but it is well-founded in human experience, and it is undoubtedly because in that corner of Asia there was, so to speak, a melting pot of human races, that we have been able to recognize in the art of Sumer something which was really unparalleled in the ancient world.

Our whole knowledge of the Sumerians is but a thing of yesterday, but as soon as any monuments came to light the question posed itself, Who were these people ? and the theory was made possible that they were of mixed origin. We know more or less what we mean by Sumerian art, and to-day it covers a wide field, but the first representations of it to be discovered were sculptures, and amongst the many sculptured figures which were found one type constantly reappeared, showing a squat, heavy, round-headed, clean-shaven man. This type was predominant amongst the monuments discovered, and it was assumed that here we had the typical Sumerian. There was evidently no mixture of race and no problem to be solved except to find out what the particular people were who were so represented. But then other monuments came to light, which, side by side with these clean-shaven, squat, solid types, showed people who were not squat, who wore short

beards and were not clean-shaven, but had their hair cut round the nape of the neck. They performed menial operations, and the theory was at once put forward that these people represented not Sumerians at all, but foreign slaves, presumably from the north or elsewhere, and certainly having nothing to do with the dominant people of the country. Then the question was further complicated. Figures of gods were found with long hair and long, elaborately combed and curled beards. Why should a people, themselves clean-shaven, worship gods with beards ? It was said, in reply, that they inherited these gods, perhaps from an aboriginal Semitic stock, whose religion was so inculcated in the country that the Sumerians took it up and carried it on. But the king is also shown wearing a beard. Surely he should not differ in race from his subjects ? So a second theory was enunciated, that these differences in representation do not connote difference of race, but simply of social status ; a caste distinction decided whether you wore a beard or were clean-shaven. For the moment people were more or less satisfied with that, but they did recognize that the two theories were not mutually exclusive, that you might have different strata in the race which would correspond to different racial origins.

Sculpture is a tricky witness in court. Very often in antiquity sculptures are not portraits at all, but are stereotyped conventions which have little to do with the people they represent. However, our knowledge has been enormously increased by excavation and the amassing of material of all kinds. We are not now limited to sculptural representations of human beings ; we have the products of the people themselves, products of every kind, and by the methods of comparative archæology we can trace back to their origin the work of men's hands. We can distinguish more or less the regional foci in which these things are at home, and so can establish racial connections amongst peoples in different parts of the world.

So for a moment we must leave sculpture and look at something quite different ; and this we can do in a certain historical order, because in the course of excavation these other material monuments are found in more or less stratified conditions which give us, not indeed any historical data, but certainly a time sequence. We can begin—because that is the obvious thing to do—with the earliest inhabitants of the country, going back to the age when for the first time men settled and lived in what had been a marsh. There have been found both at Ur and Warka human remains lying underneath all the later archæological strata, resting upon virgin soil and representing beyond any shadow of doubt the earliest inhabitants of the country ; and we can tell a good deal about them. The most characteristic thing is their pottery—vases coming from what is called the "pre-Flood level" lying upon virgin soil and illustrating the handicraft of these first Mesopotamians. Very beautiful things they are, made by hand, but made with extraordinary truth and accuracy of line, beautifully fashioned, well-baked and decorated with painted patterns. As soon as we get hold of a thing like that we can proceed to make comparisons. Sometimes the designs are more elaborate and you occasionally get animal patterns. That again helps us, for if we turn our eyes further to the east and look at the pottery that was found in the ruins of Susa, in the lowest strata

representing a sub-neolithic period, we can see there is an obvious connection between what we find at Ur and what is found in the mountains of Elam . the actual shapes are sometimes the same, and though the decoration on the pottery from

FIG 1A —SUMERIAN PAINTED CLAY CUPS, AL'UBAID PERIOD

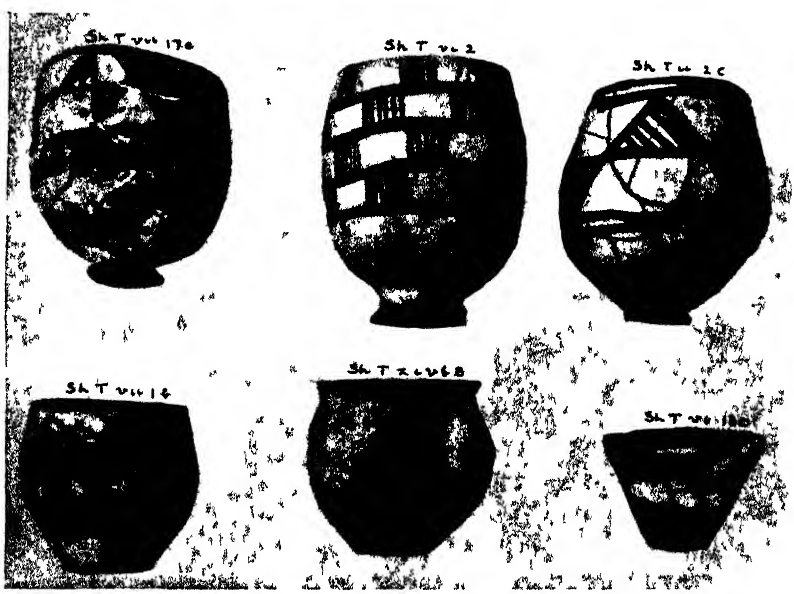

FIG 1B —PAINTED CLAY CUPS FROM BALUCHISTAN—SUB-NEOLITHIC PERIOD.
(*After Stein*)

Elam is much more elaborate, the connection is obvious. In the light of this information one is justified in saying that there was a definite cultural relation between the Mesopotamia valley and the whole country immediately to the east of it, say, the modern Persia But we need not stop short there. We can look at pots from Ur and see they are almost identical with others found by Sir Aurel Stein in Baluchistan (Figs. 1A and 1B) ; it would be difficult in the case of some of the vases

to say whether they were found in the Euphrates valley or in the Baluchistan sub-neolithic deposits. Other discoveries still further to the east and north have proved that there was a more or less uniform sub-neolithic culture extending over the Asian plateau, from Mesopotamia to as far away as the borders of Manchuria and China.

Now, we can look upon our earliest people at Ur as the westernmost branch of a great Asianic or Iranian cultural unit. We can know something of what these people were, apart from their pottery, because other remains come to light. We can picture them living in the marshes in small villages. They were apparently still in the Stone Age—at least, none of the early al'Ubaid strata have produced any sign of metal whatsoever. They were definitely agriculturists, for the implements we find in the ruins of their houses are those of farm labourers and of fishermen. We can ask whether such people were likely to be capable of much progress? A civilization based on agriculture has never yet gone very far, and if we turn to Baluchistan we find that as a matter of fact very little progress is made there. If we look at Susa we see it was relatively stagnant, and we may reasonably doubt whether Ur, and Sumer in general, could have advanced greatly if left entirely to the first inhabitants. Actually we cannot test it in their case, because of a disaster which cut short any promise which these people may have had. There came the Flood which overwhelmed their country; it must have drowned a considerable portion of the inhabitants, and it weakened the survivors morally and culturally, so much so that in time their characteristic minor arts disappeared altogether.

I have been showing you examples of early pre-Flood ware. When you come to the post-Flood period you find the same people inhabiting the country and still practising the same industries, but the decoration of their vases is simple and repetitive. No longer is there the same taste, no longer the interest in the details of ornament in themselves, but a certain rather slavish repetition which makes them monotonous; and as you go down the scale of time the designs get simpler and simpler, and at last decoration is confined to simple bands of colour without any decorative motif whatsoever. The painted pottery by which we recognize and identify our first inhabitants disappears, and another of their minor arts—a surprising one—disappears also. Below the flood level we get terra-cotta figures which are quite remarkable in their skill of design and in the delicacy of their finish; but they are limited to the lower levels. They tend to get simpler and simpler. The paint ceases to be used, you get very crude figures, and in the last stages the human figures are almost shapeless lumps of clay, representing the sculptural efforts of the last survivors of the al'Ubaid people or their immediate successors.

Of course, the al'Ubaid stock do not all die out, but when one sees, after a disaster, progressive degeneration in the pottery and other arts of a race, one can only say it is evidence of spiritual decadence; the people are on the downgrade and, whatever promise an agricultural civilization might have held at its inception, it has now been cut short and we cannot look to it for any great advance. And yet, as we follow up

Sumerian history we find that, not so long after the Flood, civilization is going rapidly ahead and producing triumphs of art. What is the explanation ? It is that the old inhabitants were not standing alone. In Eastern Anatolia and North Syria there were two great neighbouring cultures, and each of them lay upon a river which runs down into the Mesopotamian valley. The river Tigris gave relatively easy access from eastern Asia Minor right down to the Sumerian flat land, and the Euphrates gave a yet more easy approach to that flat land from the hilly country of northern Syria. When the Flood happened and the wonderfully fertile delta lay desolate and sparsely inhabited, is it not only natural that invaders should come

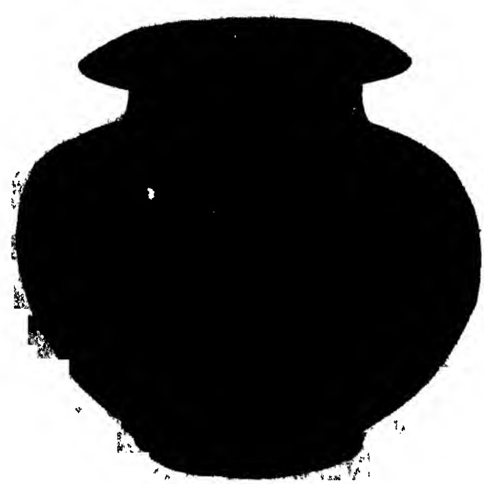

FIG. 2.—EXAMPLE OF BLACK SMOTHER-KILN WARE FROM UR.

down to take possession of the deserted fields ? It sounds a natural thing and one might assume it ; but we need not be satisfied with mere supposition. We have proof. For mixed with the decorated painted pottery of the end of the old Iranian Age we find other types of ware which are absolutely different, and which we can identify. One ware is entirely covered with red paint and burnished, and in the same strata as it we get other vessels which are much more elaborately made. They are grey or black and glossy, produced in a smother-kiln in which the heat and the escape of fumes was so carefully regulated that the pottery could be definitely carbonized in the process of firing, and capable of taking an extremely fine finish. (Fig. 2). Such a process is not easily invented independently, and when we find

that both these wares are characteristic of Anatolia and appear in southern Mesopotamia suddenly after the Flood, we have definite proof that there had been an influx of foreigners coming down the Tigris valley.

There are other forms of pottery. There is a type of vase from Ur with a very faint and unobtrusive decoration on its shoulder, a decoration which is made in a curious way. After fashioning the pot, the potter dipped it in a thin paste which covered it all over ; then, with his thumb or a rag, he wiped off the paste in parallel lines and baked the thing, and the mere difference of tone and texture gives you the unobtrusive decoration you get on the pot. On the highest part of the middle Euphrates, at Carchemish, we found a similar pot. Again, at Ur, we found a spouted vase of red clay, having on its shoulder curvilinear designs roughly executed in deep red paint, and from Carchemish comes a similar pot, spouted, and with the same boldly painted curved designs in deep red paint on its shoulder. There are other examples in other forms of pottery which clearly establish the fact that about the same time as the influx from Anatolia there came a second wave of invaders down the Euphrates from northern Syria. That gives us three nations mixed together in the Euphrates valley, and we can draw out a sort of family tree of what the real Sumerians were. For we can only speak of the Sumerians as people living in the land of Sumer who produced the art which we recognize as Sumerian ; I should hesitate to use the word as indicating any one of these three different stocks which combined to form the hybrid race.

Supposing you could prove your invasions, and prove the presence of different racial elements in the country, have you any right to say that you necessarily have a real combination of three human races ? Might they not live together and not really combine at all ? Might not the art which was thereafter produced be the product of one of these races and without any mixture of blood ? Certainly we can sometimes see the races side by side, and the process of combination would obviously be slow ; and at the outset each racial element would be fairly well distinguished ; but that, I think, would not be the case for long. In the last few years very important discoveries of sculpture have been made in various parts of the country which illustrate not only the different racial elements but also their combination, because whereas in some we can say this is a Semitic type, this Sumerian and this Anatolian, sometimes we are at a loss ; and just as is the case with the physical anthropologists who have examined the skulls found in various excavations in Mesopotamia, so it is with the art critic. The anthropologist has found in the period with which we are now dealing, when Sumerian art was being produced in its full flower, a most astonishing mixture of cranial types. That obviously has been a real mixture of races because it is the intermediate types that predominate. We can see that in the sculpture. The individual racial types are unmistakable, but sometimes you get what seem to be Anatolians, who are usually clean-shaven, represented with elaborately combed and dressed beards, which might have been borrowed from a Semitic neighbour. In a somewhat later piece you get the developed type due to the combination of different racial elements : the man comes nearer to what we

should call the conventional Sumerian, but he is still different from the people of the south.

Turning to Mari, lying on the borders of modern Syria, there has been found there a city of Sumerian date, the sculptures from which show you the Semitic type very accurately and faithfully represented. On the other hand, when you turn to the south and come to that part of the country where the invaders penetrated later, where the Sumerian element throughout history was much stronger than in the north, there you get the typical sculpture, and in the south I think we have evidence of the real mingling of the three races which combined to form the new nation.

Is that conclusion really valuable? When one assumes, or proves, that you have your three nations, and that they did join together and did produce a civilization, the question still remains, what part did each play? The old Iranians, whose pottery, beautifully made and characteristic, fell into disuse and never showed up in later ages, whose elegant terra-cotta figures are never found in any higher stratum, is it possible to say they really did have a hand in this composite culture of which one speaks? Is it not more likely they were the oppressed lower class, that they had never done much when they were independent, and that they contributed nothing at all to the magnificent civilization which is witnessed by the Tal Asmar sculptures or by the royal tombs of Ur of later date? It is very difficult to analyze a civilization whose elements are little known, but in some cases one can trace back activities, conventions from the formed art, to its simpler beginning, and one can do that here, I think, quite surely, because we have the great assistance of having found in our lowest strata traces of the unmixed Iranian people, so that we can actually say what they did and could do, and can watch the development or disappearance of their characteristic work in our later levels. And while it is perfectly true to say that some of their arts have vanished, we can establish the fact that others did not, and we can, I think, see also why they did not.

The pottery went and the figurines went, but in one art of later ages we are definitely indebted to the earliest inhabitants of the country, and that is architecture. The architecture of Mesopotamia is peculiar. If one thinks of these primitive people settling down in a marsh, wishing to build houses for themselves, desirous certainly, in time, of building temples for their gods, what can they build with? There was no stone in the country at all. They had no material except clay, and the reeds that grew in the mud. Such architecture as they could, and did, produce literally grew out of the soil. It was at home in the country in which it was evolved, and that is why it did not disappear. It began early, and we can definitely give credit for it to the people who lived there before the Flood. Underneath the Flood level we find the remains of properly moulded clay bricks. Already, then, these people had devised the art of making bricks, and presumably therefore of putting up buildings with a certain claim to be considered architectural. They did not use only bricks, but employed still more primitive substances. We find lumps of clay which had been hardened by fire: one side has a smooth surface, which may be curved or straight, and on the other side is a series of concave lines; if you look into

these you will find, running up and down the lines, the imprint of the grain of reeds. The burnt lumps come from reed huts which were plastered with clay, but whereas the outer surface of the clay is very often straight, it sometimes goes in curves which may be either convex or concave. The early settlers, like the modern inhabitants of the country, used reed fascines as uprights for the mainstay of the house, and joined them with ties consisting of horizontal bundles of reeds. Over this framework they fixed reed mats and then, finally, mud-plastered the whole (Fig. 3). The curves we get on our lumps of burnt clay prove that the architect did not simply daub the outside of his building and disguise the construction; he actually followed the reedwork in his work, and emphasized its structural features. That is in itself an

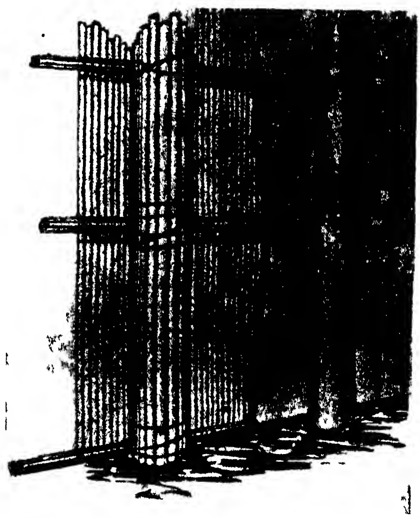

FIG. 3.—RECONSTRUCTION OF SIDE OF PRE-FLOOD HUT, SHEWING PANELLED EFFECT.

artistic performance, and it sets an example; for when the Sumerian architects started to work with bricks, they seem to have admired the panelled effect of their reed buildings and reproduced it in the brickwork, with, of course, a tendency to substitute straight planes at right-angles for the curves of the reed bundle covered over with plaster. But all through Sumerian history the characteristic wall of a temple is a wall with buttresses which reproduce, in fact, the reed uprights of the aboriginal hut. (See the section of wall immediately to the right of the columns in Fig. 4.)

Mud is a rather poor material for building on a large scale. A mud surface tends to get washed away by heavy rain, and the primitive man in the valley discovered a means which could counteract that fault. He studied his material and found that if he reinforced the surface of his wall with an armature of hollow clay cones let into the mud plaster he produced something infinitely more lasting and at the same

time more decorative. These cones were six to eight inches long, and when they were set into the wall high up in a great building their rings of light terra-cotta with discs of black shadow in the centre gave an effect of mosaic, and set an example which the architect was not slow to follow. Decoration by cone mosaic accordingly became a standard of Mesopotamian building, the purely utilitarian consideration of the original clay cone being lost sight of to a certain extent, or at least supplemented by a desire for a decorative effect. The cones were pointed at one end and painted red or black and were arranged in elaborate geometrical patterns. The great palace at Warka (Fig. 4), discovered last century by Loftus and now excavated by Mr. Jermans, is a building standing in the open air ; the walls themselves and the columns of the great hall stood exposed to the weather, but the mass of cones which formed practically a terra-cotta facing to the mud wall was not only strikingly

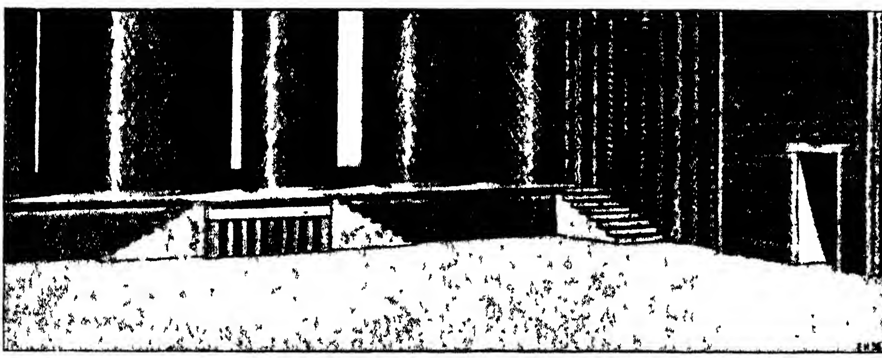

Fig. 4.—Columned Hall with Mosaic Incrustation at Warka. Uruk period. (*After Noldeke.*)

beautiful but also an extremely effective protection, so that a great deal of the decoration is still in place after something like 6,000 years. A further development of wall decoration is found in the First Dynasty temple at al'Ubaid of about 3,000 B.C. Here the effect is purely decorative and the technique is carried a stage further. There is one other natural product of the country, bitumen, which is a superior form of mud and being waterproof was freely used by people to protect their buildings and also as an adhesive material. The al'Ubaid mosaic is fixed in bitumen. From the cones, therefore, you rise in the end to real inlay or mosaic work with bitumen in the wall as a background instead of mud. There you get a definite line of descent from the most primitive people, the first Iranian inhabitants of the valley, right down into and beyond the flower of Sumerian art.

Another illustration is the column. Of course, there were trees in the valley, but the palm tree is the commonest, and people who had the palm tree growing amongst them were bound to understand the use of columns. At the Palace of Kish there are columns standing in a row, and the building dates back to well before 3,000 B.C. An example from al'Ubaid gives a wooden column overlaid with

incrustration set in bitumen. The tradition, taken over from the earliest people, was not lost, because in the Third Dynasty (2,300 B.C.) you get columns made of specially moulded bricks, and in 1,990 B.C. we have a column standing by the entrance of the doorway, free and in the round, with its surface carefully moulded into a series of triangles in low relief, which imitate the palm-tree trunk.

There you have a tradition which does do justice to the influence of these earliest people on the composite culture. What then did the newcomers introduce? We must remember that up to the time of the Flood the Mesopotamians seem to have been living in the Stone Age, and almost necessarily so, because there was no mineral ore in the valley at all. They could import flints from the upper desert and chip them into shape, but mineral deposits were absolutely lacking. There was

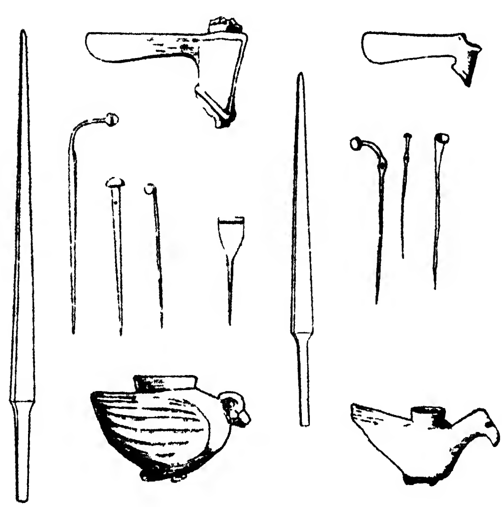

FIG. 5.—METAL OBJECTS AND STONE VASES, SHOWING CULTURAL DEPENDENCE OF SUMER ON N. SYRIA. (*Sumerian objects on left ; North Syrian on right.*)

also no stone on any large scale. All these things had to be brought in from abroad, and they would not have been brought in unless people in the valley understood the use of them. The Iranians could not understand them, and we must turn to our newcomers, who did introduce a great many things. As soon as we can trace the first evidence of the presence in the country of the Anatolians and North Syrians there are radical changes in the manner of life of the people. Even pottery is a case in point, because whereas the painted pottery of the pre-Flood people was made without the wheel, all the new types are mechanically produced. The invention of the wheel therefore was introduced by the northerners, who applied it not only to the art of potting, but to vehicles, for we get wheeled chariots and carts, and that is an extraordinarily important thing, because it means that at once enormous tracts of country were opened up to trade and conquest, so that

civilization could on the one hand be developed at home by contacts with other people, and on the other hand could be carried far afield by the superior mobility of the Sumerian troops.

We find that the Sumerians were amazingly proficient in metalwork—and yet the raw material had to be imported. Where did they learn the casting? If we compare the metalwork, such as pins, adzes, axes, etc., which is found at Ur and in the Carchemish district, we find that identical types occur (Fig. 5). Metalwork was introduced by the northerner, inevitably so because the mountains of Anatolia are amazingly rich in minerals and in the range bordering the North Syrian province there is gold and copper in abundance. Therefore the metalwork is due to our post-Flood invaders.

They brought another thing, too. They came from a mountain country and were accustomed to work in stone. After their influx we find at various sites, such as

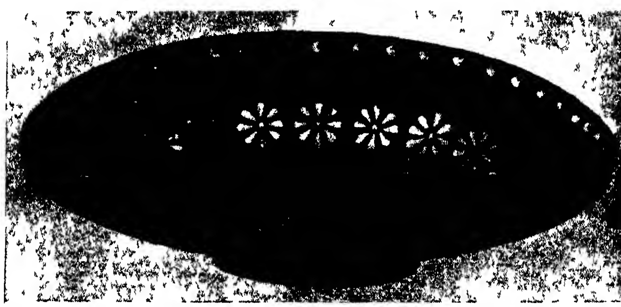

FIG. 6.—INLAID STONE BOWL ILLUSTRATING CULTURAL RELATIONS WITH THE AEGEAN.

Warka and Ur, walls the lower part of which is built in stone. Stone had to be imported by them from a distance, and the use of it is a pathetic souvenir of their original country. For religious reasons they felt bound to keep to that material which had been regularly employed in the temples in Anatolia and North Syria, and for a long time this perverse custom was continued. But they did not merely build in stone—that was a temporary aberration, one might say—they were skilful workers in stone. We find an enormous number of stone vases, which could never have been made or thought of by the old pre-Flood Iranians. They are very often simple; sometimes they are decorated. The influence that produced a bowl (Fig. 6) of dark steatite inlaid with dots and flower rosettes of white stone or shell is North Syrian, and anybody looking at it is reminded of stone vessels also inlaid with white dots and of pottery vessels with white rosettes painted on a black surface which are found in Minoan Crete. We seem to have unexpectedly discovered a link between Sumer and Knossos, and the bridge between the two must be the Semitic North Syrian culture. Other stone vessels are decorated with carvings in relief; one shows a procession of bulls going round and round the cup. Crude as it is, it is the simple beginning of a well-known Sumerian convention which, at a later date,

culminated in beautiful examples where the realism of the animals is only equalled by the decorative effect of their arrangement.

At Warka was found the most magnificent stone vessel yet discovered in the country ; it represents the high-water mark of early relief in stone, and it also illustrates the great skill of the Sumerian artist in dealing with animal forms. Here we may suspect northern influence, for in Anatolia and North Syria you get animals represented with extraordinary skill. In a shell engraving from Ur, quite apart from the excellence of drawing, the animal characterization is marvellously successful. In all the scenes you get animals playing the parts of men : a donkey in one of them is playing a harp and a jackal the sistrum. In another case, in a seal-impression, a lion, the king of beasts, sits on his throne and other animals bring him presents and play music before him. How could this play of fancy have originated ? We are at a loss, in a sense, because this is the earliest illustration of it we have, and it does not somehow seem quite at home amongst the Sumerians. It is interesting therefore to find at Tell Halaf, on the North Syrian border, a stone relief which, at a much later date, reproduces the motif of the animal orchestra.

I have spoken rather vaguely of the northern peoples. I began by pointing out and emphasizing the fact that there were two northern elements, or rather a northern and a north-western, but I scarcely attempted to distinguish between the two when it came to tracing their influence on Sumerian art. It would be interesting to establish precisely the extent to which that art was indebted respectively to the Caucasian and the Semite. As it is, we are not able to do that, because our knowledge is not great enough. We do not know what the people in Anatolia and Northern Syria were like in their early and uncontaminated state : there has not been enough excavation, and we have got no material. When these peoples finally emerge into the stage of history, they have already been influenced by external influences. As a matter of fact, what had happened was that the tide of culture had flowed back in its channel, and Sumer, however much indebted it had been in the past, had in its turn profoundly modified the culture of its northern neighbours, and the Syrians had already been long in contact with the Mediterranean and subject to the influence of Egypt and possibly of other western centres also. We are therefore at a loss. In view of the rather negative results that have been obtained in Anatolia by the only expedition there, results which show that very little progress was made until a relatively late day, it is tempting to suggest that to the Anatolian invasion of the Euphrates valley was due the introduction of technical knowledge and skill, and that that was all ; whereas to the Semites we might, in view of what we know of them in later times, give credit for that inspiration without which Sumerian art would have been impossible. It is tempting to do that, but frankly we are not justified yet in doing so. We must do more work. We need more excavation, more material evidence before theories can be other than very hazardous indeed.

Actually, about Mesopotamia we have found out only a tithe of what is to be known, but we have found out a good deal, and the centre of scientific interest is

now shifting away from the lower valley of the Euphrates to the north and north-west. I think the most interesting problems now waiting to be solved must be solved in the north-western area. In this cultural centre in the northern corner of Syria—where certainly there must have been early progress if only because of its geographical position—people were definitely open to cultural influences from Sumer and Southern Syria, from Egypt, from the Anatolian north, and from the Mediterranean, so that they were not only able to receive instruction from more advanced people than themselves, but they were in a position to hand on what they had learnt or imagined, and so to influence others in the east and west. Maybe we shall find that the dynamic centre for the growth of civilization was not so far away as Mesopotamia. In Syria the advance was never so great as it was in the countries both to the east and to the west; yet both of those may be found to have been indebted to the people of the important geographical knot on the lower Orontes.

I must end up with a confession of ignorance, but also a profession of belief in what future excavation may give. We have established the fact and importance of racial mixture in one centre. All that that implies we cannot know until we have excavated further each element in the mixture and have got to know the early Syrian and early Anatolian at least as well as we can picture the early Iranian inhabitants of Sumer in the pre-Flood age.

THE CHAIRMAN, in conclusion, said: Sir Leonard and Lady Woolley are leaving almost at once for northern Syria, and hope to begin work there towards the end of next month. When we thank our lecturer, as I ask you to do, for the very learned and most interesting address he has given us, which I am sure will open problems in our minds that we should not otherwise have taken an interest in, I will ask you to join me in wishing them great success and in hoping that we shall have them back here before long with more results as interesting as those they have been getting at Ur of the Chaldees.

OBITUARY

LIEUT.-COLONEL RICHARD DE VILLAMIL.—Colonel de Villamil, whose death at the age of 86 is announced, was elected a Fellow of the Society in 1911, and was at one time one of the most familiar figures at its meetings. When close upon 80 years of age the late Colonel made a series of interesting discoveries in connection with Newton, as the result of tracing down a considerable portion of his library to a country house near Cirencester. The use which Newton had made of his books, and the notes which he had made in them, provided useful new material for the study of the philosopher's methods of study and thought, much of which was worked up by Colonel de Villamil into the book which he published in 1931, called "*Newton: the Man.*"

Colonel de Villamil had served in the Royal Engineers.

NOTES ON BOOKS

ENGLISH CHINTZ. By Frank Lewis. Benfleet : F. Lewis, Ltd. 63*s*.

While the main interest of this book no doubt is the fine collection of over a hundred and fifty photographs of printed cloths, Mr. Lewis's descriptive foreword is a valuable accompaniment—the general reader will find it most useful.

Chintz, from the Hindu *Chint*, meaning coloured or variegated, was introduced into Western Europe and England from India. In the first century A.D. Pliny gave an account of the printing of fabrics in Egypt, and by the Middle Ages people in England were wearing block-printed dresses and using block-printed cloths for decorative purposes. These early chintz designs were based on woven patterns, which was more conservative than sensible—since the block allows almost infinite scope.

The importation of fine Indian chintzes began in the seventeenth century, and it was a long time before our native imitators could compare with the Eastern manufacturers for a grasp of fast dyeing, knowledge of mordants and of resist-dyeing. In the next century protective laws were passed, and not repealed till 1831. English weavers benefited, but English chintz had to make a new start at a very gloomy point in this country's æsthetic course. During the brighter century that went before, it had only been legal to print fabrics containing a linen warp. The plates show that besides patterns of an ambitious but irresistible *Toile de Jouy* stylishness our craftsmen in this period produced some exquisite materials of a more legitimate type. (See Plate 7.)

The luxuriant Victorian examples that Mr. Lewis has brought together in this book are representative of the best, not of the average, work of the age. Even so, if the illustrations were in colour it would be easier to appreciate the importance of the Morris movement—of that note of sobriety and that structural definition which Morris imported into the arts of design. A comparison between Plate 114 and the ones following is very suggestive ; and 122 and 123 again should be noted.

Though Mr. Lewis pays a well-deserved tribute to certain designers of the present day he makes no mention of a trio of women whom he ought certainly to celebrate, and who, though they are primarily hand-block printers, have been invited to contribute designs for mass-production. The only plate showing a "typical present-day modernist design" is not as modernist as all that. (I refer to 105.)

P.B.

A HANDBOOK OF COLOUR : INCLUDING THE OSTWALD THEORY AND ITS PRACTICAL APPLICATION. By T. A. V. Judson, B.Sc., Leicester : The Dryad Press. 5*s*.

This "Text-book for Teachers and Students of Art" is a clear and simple exposition of the theory underlying Professor Ostwald's system of colour relations. In the first two-thirds of the book we are presented with a summary of his theory of colour and its application as a basis of teaching, the diagrams being mostly reproductions from the German text. The closing chapters deal with visual experience in the perception of form and of luminosity as affecting colour. The introduction of simple exercises from time to time should make the work of practical value to those engaged in inculcating the system.

But to the colorist doubts must inevitably present themselves as to the adoption of a theory which produces results widely differing from æsthetic experience. It claims, for instance, to account for every possible colour, shade or tint perceived by the eye, yet makes no distinction between the infinite variety of those neutral

tones known as *tertiaries*, arising from the mixture of two or more pure hues, and those produced by the use of black, of white, or of both, to modify a pure hue. This admission of achromatic white and black naturally leads to no distinction being made between the rich *depth* of a fully saturated hue and the *dark* value of a colour adulterated with black. Again a system which allocates fully one-half of the spectrum range to the cold blue-green and green-blue areas, whilst eliminating the deep-red end, arouses misgivings as to a colour-visual defect in red among advocates of the system.

It is noteworthy that no proposition of harmonious relations between more than two pure hues is brought forward in the handbook, though in Ostwald's manuals it is suggested that such relations can be indicated by applying equal-sided symmetrical figures, such as the equilateral triangle, the square, etc., to his colour circle ; the angles being taken to indicate an appropriate choice of unlimited range. Probably experience has already shown that in the case of uneven-numbered angles such indication is impossible, and in that of the even-numbered ones the choice is extremely limited.

It is unfortunate that in the handbook the German colour term *ocil* (violet) should have been translated as " purple." Violet as a distinctive colour thus becomes eliminated, though it is essential for the completion of the spectrum range.

M. SARGANT-FLORENCE

IDEAL HOME EXHIBITION

London's great fair creates an extraordinary impression of " things *about* to come " —with luck. But that is being pessimistic. We need not trust to luck if we use our brains : if we have good will : if we put our heads together. Co-operation—that, of course, is the watchword. We do not need quite so large a choice of perfumes, bath-mats, mangles, wireless sets, breakfast cereals—we need a little more of each commodity.

" Things to come," interpreted in the Wells way, means to one exhibitor a clean-cut world of glass. One can imagine the Man in the Moon living in a house furnished like this, sitting in a glass chair on a glass veranda, and looking out on to a cold white landscape of extinct Fujiyamas. The Concrete Association have an interesting model of a concrete City to Come : who knows ?—neat honeycomblike stacks of flats and office buildings, admirably laid out among lawns and playgrounds. But the individual family house is not losing ground. This year there are two fine wooden ones, but the best (full scale) model is brick and tile in the south-east of England style. All the houses are equipped for utilitarian purposes in the latest and best way : there has certainly been a revolution in domestic economy since the war. And all the new apparatus can be got on the hire-purchase system, and so can pianos, and radiograms —to tell the truth, most things can, even pictures.

Rooms of the famous film stars are a great draw on the third floor. Miss Mae West and Mr. Leslie Banks come out equal top, but they get their marks for different excellences. Miss West's bedroom is perfectly Mae West—late Victorian Louis Quinze : dull gold satin everywhere, and no nonsense about modern improvements on the ideally luscious. Mr. Banks' study is the room of a man of taste—just a room, with some good old furniture and some good new glazed chintzes over the chairs, and books, and an atmosphere in which one could sit and read or be at peace. As for Miss Shirley Temple, her nursery has an almost scandalously desirable built-in doll's house which takes up about a third of the whole.

Then there is a series of rooms called "How the Other Half Lives." The selection is very eclectic. Side by side are the cell of a Benedictine monk and the wardroom of a submarine crew. The monk served in the war, the catalogue tells us. The undergraduate's room further on is based on the room Lord Haig had at Brasenose. The Paris art student's attic is " romantic "—very squalid and with no lovely gauges and pipes and valves like the submarine : in spite of the catalogue, the impression young visitors and old alike will get is that romance is more uncomfortable than seafaring, even under submarine conditions—and so no doubt it is.

The present reviewer had the advantage of being accompanied round the gardens by the voice of a human nightingale. A Chinese gentleman might think this part of the show rather congested. The Western taste for flowers springs from the energetic Westerner's delight in them because they *grow*, and can be made to grow in *profusion*. We have little of the Far Eastern feeling for the beauty of a single chrysanthemum in a vase. The gardens at Olympia are a riot, and all the tulips as plump as little roasting pigeons. From time to time the voice of the nightingale (in *Bohême*) was drowned, almost literally, by the splashing waters of the realistic waterfalls. If ever we have to live permanently underground, deep enough to be safe from the latest bombs, we can anticipate a very charming sort of Hades, with panoramas to rival the real thing, and artificial sunshine for as many of the twenty-four hours as we please.

The Gallery of Art, that is, Fine Art, is not a great thrill at Olympia. But not far away we find a triumphantly achieved toy dog, an unmechanical beast with legs so hinged that he will trot obediently behind one on his lead. He is a work of art. He is British. His name is Reggie, and he is soon to be on the market.

Some real cows are among the other chief attractions of the exhibition.

P. B.

CARBON BLACK

There are probably only a few who will associate carbon black with the motor industry, yet it is an essential part of the rubber tyre, to which it imparts tensile strength, hardness, impact resistance and ability to resist wear. Without it, or some equivalent substitute, motoring as we know it to-day would be a very different matter, if not out of the question.

Carbon black is " hydrocarbon " soot ; it is made by burning natural gas, and is in reality a development from lamp-black " oil " soot with which the kerosene lamp has made us long familiar. In industrial practice the natural hydrocarbon gas from the oil wells is burnt in a multitude of small flames which impinge on the under sides of metal surfaces. The design of the burners, the temperature and the amount of air admitted during burning, aim at getting the maximum of carbon deposited in the form of a webby mass which is scraped off mechanically for further treatment. As initially produced it is very light in density, weighing only about 4 lb. per cubic foot. This material is densified by compression into blocks and shipped in bags to the user. The process is both dirty and expensive, so that it is being replaced by a new method of intense stirring or churning of the black, whereby the original spongy mass is freed of much of its air and the carbon is aggregated or rolled into minute spheroid particles having a bulk density of about 20 lb. per cubic foot. In this state the material flows freely ; indeed, it has been found possible to handle it almost as a liquid and even to convey it in appropriately designed tank cars from the producing points in the south of the United States to the sites in the north where the rubber factories are located. In this way a very marked improvement in the product has been effected.

Carbon black was actually first produced at New Cumberland, West Virginia, in

1872, though it was many years later before its use in the rubber industry was discovered. To-day, its manufacture is subject to fierce economic competition and it is effected in remote oil-bearing areas which often lack the facilities offered by pipelines to convey the gas which they produce to cities: as this gas has no other outlet it is of low cost. Such localities are to be found in Texas and Louisiana. The manufacture of carbon black has been begun in Japan and attempts are being made also to produce it in Russia and Roumania.

There is no limit to man's inventiveness: having available at low cost large quantities of natural gas which formerly went to waste, he not only burns it to give heat and power and to produce carbon black, but also, under quite other conditions with plenty of air, to produce carbon dioxide, which is utilised for refrigeration purposes. The gas is first burnt with an excess of oxygen, then the mixed products are cooled and washed free from impurities, and finally the carbon dioxide gas is isolated by means of absorption as bicarbonate and recovered from this by heating. The pure gas is liquefied and expanded under pressure in what are called snow chambers; the liquid then solidifies and the snow is afterwards compressed into solid blocks of CO_2, which are colloquially called "dry ice." There were twenty-five such pyrolysis plants in being in the United States in 1932, which between them produced 600 tons a day.

This note illustrates how wide indeed are the uses of natural gas hydrocarbons; they produce heat, light and energy in every form for a myriad applications, intense cold and an essential constituent of the motor tyre. Even then we have said nothing of the use of carbon black as a pigment for inks. It is even possible to make this sufficiently free from grease to be water miscable. E. F. A.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, APRIL 6..Architects, Royal Institute of British, 66 Portland Place, W. 8 p.m. H. A. Dod, "**Library Planning.**"

Brewing, Institute of, at the Horse Shoe Hotel, Tottenham Court Road, W. 6 p.m. H. L. Hind, "**Some Impressions of Brewing Conditions in America.**"

Electrical Engineers, Institution of, Savoy Place, W.C. 7 p.m. Discussion on "**That the Electric Supply Industry should sell Service,**" opened by N. F. T. Saunders.

At the James Watt Memorial Institute, **Birmingham.** 7 p.m. (1) J. A. Sumner, "**Private Plants and Public Supply Tariffs.**" (2) F. S. Naylor, "**Loss of Revenue on Heating and Lighting Loads, due to Poor Regulation.**"

Petroleum Technologists, Institution of, at the Royal Society of Arts. 5.30 p.m. Technical Discussion on "**Liquid Fuels from Coal.**"

Transport, Institute of, at the Institution of Electrical Engineers, Savoy Place, W.C. 5.30 p.m. W. V. Wood, "**The Problem of Railway Charges.**"

Victoria Institute, at the Central Hall, S.W. 4.30 p.m. Dr. R. E. D. Clark, "**The Present Position with regard to the Origin of Species.**"

TUESDAY, APRIL 7..Anthropological Institute, Royal, 52 Upper Bedford Place, W.C. 8.30 p.m. Dr. M. A. Read, "**Tradition and Prestige in Ngoni Society.**"

Civil Engineers, Institution of, Great George Street, S.W. 6 p.m. Sir R. Hadfield and S. A. Main, "**Corrosion of Iron and Steel.**"

East India Association, at the Caxton Hall, S.W. 4.30 p.m. Sir P. Chetwode, "**Some Aspects of the Defence of India, now and when the Reforms Materialize.**"

Electrical Engineers, Institution of, at 17 Albert Square, **Manchester.** 7.15 p.m. G. A. Burns and T. R. Rayner, "**Remote Control of Power Networks.**"

At 39 Elmbank Crescent, **Glasgow.** 7.30 p.m. Dr. R. J. Reynolds, "**Cineradiography.**"

Marine Engineers, Institute of, The Minories, E.C. 6 p.m. J. D. Farmer, "**Recent Developments in Marine Refrigeration.**"

Photographic Society, Royal, 35 Russell Square, W.C. 7 p.m. J. E. Saunders, "**Some Tiny Cameras—Advances in Apparatus.**"

Sanitary Engineers, Institution of, at Caxton Hall, S.W. 6 p.m. A. Sciver, "**Some Problems of Trade Waste Disposal.**"

WEDNESDAY, APRIL 8..Engineers, Junior Institution of, at the James Watt Memorial Institute, **Birmingham.** 7 p.m. E. A. Watson, "**Modern Automobile Electrical Equipment.**"

Horological Institute, British, 35 Northampton Square, E.C. 6.30 p.m. J. H. Seager, "**Modern Art in Clock Design.**"

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MEETINGS OF THE SOCIETY

NEXT WEEK

MONDAY, APRIL 20TH, at 8 p.m. (Peter Le Neve Foster Lecture). REGINALD E. STRADLING, C.B., M.C., D.Sc., Ph.D., M.Inst.C.E., Director of Building and Road Research, Department of Scientific and Industrial Research, "Problems of Road Research." (Lecture I.) (Illustrated by lantern slides.)

The Syllabus of the Lecture is as follows: (*a*) FOUNDATION STUDIES—soil mechanics—characterisation of soils—examples of failures in cuttings—settlements and drainage—water content. (*b*) CONCRETE SLABS—Westergaard's theory—subgrade reaction—concrete mixes—aggregate grading and bulk supplies—difficulties of control—best mix theories—workability as rational criterion—importance of sand content—water/cement ratio—testing by core cutting.

WEDNESDAY, APRIL 22ND, at 8 p.m. (Ordinary Meeting). VICE-ADMIRAL SIR PERCY DOUGLAS, K.C.B., C.M.G., "The Port of Liverpool" (illustrated by lantern slides). SIR RICHARD HOLT, Bt., Chairman, Mersey Docks and Harbour Board, will preside.

PROCEEDINGS OF THE SOCIETY

TENTH ORDINARY MEETING

WEDNESDAY, 5TH FEBRUARY, 1936.

A. E. RICHARDSON, A.R.A., F.S.A., F.R.I.B.A., Professor of Architecture in the University of London, in the Chair.

THE CHAIRMAN, in introducing the lecturer, said:—A distinguished lecturer like Mr. Oswald Milne needs no lengthy introduction from me. Mr. Milne is not

only a member of the Council of the Royal Society of Arts ; he is a very brilliant architect. Moreover, he is a very courageous man. He is going to tell some home truths to-night, and I am expecting an interesting debate from the members of the audience.

The following paper was then read :—

MODERN ARCHITECTURE—FASHIONS AND TENDENCIES

By Oswald P. Milne, F.R.I.B.A.

I am going to begin this lecture by throwing on the screen in quick succession two slides of quite modern buildings, which, I think, will show at a glance that there is reason for bewilderment as to the direction in which architectural style is heading. This prompts us to question what are at the present time the guiding principles behind this necessary art. Are we evolving a new architecture, or are we just drifting among fashions and stunts with a passion for constant change and a desire to be different at all costs from the generations that have gone before ?

You are all no doubt familiar with the great styles of architecture. The school text-books deal faithfully with these. You remember how neatly they are labelled—Classic architecture of the Greeks and Romans ; Gothic architecture of England and France, again subdivided, as far as England is concerned, into Norman, Early English, Decorated, Perpendicular. But for all their careful arrangement under named headings in the text-books, these architectural styles were really a gradual evolution one from the other. It was a matter of centuries for the massive work of the Normans to develop into the delicate fantasies and the lace-like traceries of, say, Henry VII's Chapel at Westminster, but the steps of this progression are perfectly clear if we have time or inclination to follow them out.

The decay of feudalism and of the spirit of the Middle Ages was hastened by the new ideas and new learning coming from Italy. A new mode of architecture, based on the revived culture of ancient Greece and Rome, grew up. This architecture we have appropriately termed " Renaissance." It was developed in this country in a masterly manner by Inigo Jones and Sir Christopher Wren, whose influence was apparent right through the eighteenth century. Our stately porticoed buildings, symmetrically planned and with rhythmically spaced windows, we owe to this Classic tradition. Italian grandeur was translated under English conditions into the homely and pleasant Georgian architecture that we know so well in our manor houses and the charming flat-fronted houses of our country towns.

It is a truism that the architecture of every country and every age is the outcome of the needs, customs and thought of the people who create it. Climate and the materials to hand influence its forms and its aspect. Man does not suddenly invent new styles ; he has evolved them gradually to meet the demands of his age. Yet when we look around us to-day at the numerous buildings in town and country that are springing up, often with such disconcerting and disagreeable faces, we find it difficult to believe that these same influences are at work. But bye and large our

building, both considered and ignorant, reflects our outlook and social conditions. It certainly spells a state of mind that is chaotic.

Social and economic change has of course been continuous throughout our history. Up to the time of the Industrial Revolution it had been like a slow-moving stream, but from the days of Watt and Stephenson the pace has quickened until it has become a cataract. The discovery of the power of steam and all the inventions that followed brought an incredible change into the life of man. Up till that time

" Wildwood," Seal, Kent. Architect : Oswald P. Milne, F.R.I.B.A.

man's swiftest movement over the face of the earth was the pace of a horse. In a few decades he was to have command of the railway train, the motor-car and the aeroplane.

Architecture, formerly subject to a gradual evolution, was called upon to meet this rapid change. Man has shown himself unequal to the task of suddenly inventing a new style of building, and nothing less would adequately express the new mechanical powers of which he had become possessed. The *tempo* of change had been too fast for him.

In the time of the rise of the factory system the mere task of dealing with the expansion of towns and industrial areas absorbed so much energy that building became as a rule an unconsidered matter of construction quite divorced from any

art, or if architecture was attempted, it became a matter of creating a make-believe and romantic background to a materialistic life. This explains the Gothic revival of the early years of the nineteenth century. Our grandfathers and great grandfathers, bent on exploiting the machine and making money, lived and carried on their work behind curious façades built in a style that drew inspiration and life from an age with a singularly different outlook. This architecture without any roots was bound to wither and was followed by other revivals. Trains steamed into Gothic and Greek railway termini. Parliament made laws and judges dispensed them under Gothic vault and storied window. Town halls were decked in Gothic or Classical dress, while church, college and school were adorned with pinnacle and battlement. The town grew haphazard ; factories made no pretence to form or plan, and domestic architecture became an ignorant hash of styles.

The question we have to answer is—Are we to-day emerging from this muddle ? Considering the powers of which we are possessed, is our architecture finding a form expressive of our machine age or is it the sport of changing fashion ?

I should like to recall the ideas and influences that I have seen working from the beginning of the twentieth century, the time when I began to study and practise architecture. When I first came to London the force of the Gothic revival had spent itself. We were much preoccupied with the teaching of William Morris and his school, and conscious that the beauty of building depended on the right use of material ; that texture and colour were important matters ; that the machine-made copy of something formerly wrought by hand had no spiritual value. It was due to these ideas that we demanded such ordinary building materials as brick to be manufactured of an honest baked clay of good colour. At that time it was only possible to obtain bricks of the brightest red, and when I told a maker that I must have a brick of varied colour and roughish texture he said, " For the last thirty or forty years we have been doing everything we could to produce a brick of perfectly even colour, smooth and square-edged, and now you come along and demand the reverse."

Norman Shaw, designing in the free Renaissance manner, was the master we looked to, and Voysey with his long low white houses with black chimney pots and sloping buttresses was the vogue—a very pleasant vogue and an influence from which much attractive domestic work sprang.

On the Continent a fashion (I cannot call it more) dubbed " *L'Art nouveau* " was holding sway. We English, with our native caution for anything new, did not embrace this wholeheartedly, but the more advanced young architects over-emphasised the entasis of columns, trimmed their work with flat O.G. mouldings, and introduced hearts and birds as decoration in unsuitable places. They proclaimed enthusiastically that at length a new and fundamental art had been born, but their enthusiasm was not unlike that of some of my younger friends to-day, who hail the fashion of the moment—the flat roof, the angle window, the line of solid balcony—as the essence of a new art.

There followed, before the War, a period when the cult of the antique was

dominant. The cultured man and his wife lived amid Tudor, Queen Anne or Chippendale furniture, so that a great industry in the most realistic fakes of such furniture, even down to the wood-worm holes, flourished.

But in architecture this was by no means a negative decade : such men as Lutyens were showing how, used with imagination, English styles of the past could be invested with a freshness and life to serve new needs and new social conditions. Giles Scott, at that time a young man and the heir of two or three generations of architectural talent, was doing the same for Gothic forms in church building at Liverpool

" HOUSE FOR THE ARCHITECT " AT WENTWORTH ESTATES, VIRGINIA WATER, SURREY. Architect : Oliver Hill, F.R.I.B.A.

and elsewhere. Lanchester was evolving the modern civic hall. In the main we had gone back to the last traditional phase of English architecture—Georgian—for inspiration, and were adapting this to meet new demands. Ideas as to the need of definite planning of our towns were in embryo ; Sir Raymond Unwin was giving proof at Letchworth and Golders Green that the planned town or suburb, with the buildings designed by the trained architect, were pleasanter places to live in than the haphazard development of the Victorian period or the ignorant performances of the speculative builder. Yet this lesson is still to-day very far from being learned.

Then came the War with its stark realities making a deep incision across the world. Social and industrial organisation in ordinary times move along so smoothly

that mankind does not perceive where they are tending, but the World War, like an earthquake, shook down the walls of habit and made us look around with new eyes, to discover that our landmarks had changed.

We were forced to realize fully that mechanical power and economic forces were in control of our civilization. Cheap labour was a thing of the past, so in every direction ingenuity was bent towards displacing man-power by the machine. Born of catastrophe, new ideas as to the ordering of human destinies were engaging men's minds. In Bolshevik Russia there was to be a clean cut from the old order. The machine was a god to be worshipped. An architecture suited to the new ideal was to divest itself of sentiment and tradition, and buildings were to be consciously designed to function merely as a machine for living.

This idea was not confined to Russia. Germany also developed a functional and robot-like architecture. In France the philosopher-architect, Corbusier, preached and endeavoured to formulate an architecture suited to the machine age. With more enthusiasm, perhaps, than practical ability, he and his disciples put up structures of stark nudity. The only really inherent quality asked of these buildings was that they should meet practical needs and function properly, so that it is disillusioning to find that even in this respect they often fall short of the traditional methods of the more conventional builder. However, the pioneer has to be spectacular in order to rivet the attention of his contemporaries.

Although in England, after the War, naturally conservative, we felt this new architecture to be too freakish for our taste, yet something of its vital influence touched us. There was a movement for greater freedom of outlook. Instead of looking backwards to traditional forms for inspiration, we hesitatingly admitted that a changed world might need a new dress to express its mechanical-mindedness. Although we moved slowly there can be no doubt that a new, interesting and inventive spirit began to animate not only our architecture but also the decorative arts.

With this new freedom the architect can attack his problem with no preconceived ideas as to the architectural lines of his plan or the style of its exterior. The plan need not follow convention ; the thing that matters is what is going to happen in the building, what use every part is going to be put to, and how the whole can be arranged so as best to meet these needs. This is not to say, as the functionalist would have us believe, that good and scientific planning is a new thing. Fine buildings have always been dependent on good planning, just as poor architecture has been the result of muddled planning. But it does mean that we are once again putting the horse in front of the cart. We are first of all thinking of the function of the building ; then, if to that we can add the qualities of space, dignity, proportion and contrast, the real architectural qualities, so much the better.

The trappings associated with traditional architecture are also being cast aside, both within and without. The columns and pilasters, the pediments and cornices, the egg-and-tongue moulding and conventional architectural oranaments are being abolished. The result is that to get any quality into our work, and I maintain that

it is quality that really matters in any building, we depend on mass and line for our effect, rather than upon detail.

It is these qualities of simple massing that one finds is characteristic of modern architecture, though somewhat bald and primitive they may often appear to be. I can well imagine the lover of architecture pointing to the straight cylindrical poles and the bare uprights that serve as supports to the modern building and contrasting them unfavourably with the Ionic or Corinthian column of the classic builders, with

DETAIL OF ENTRANCE, " HIGHPOINT " FLATS, HIGHGATE HILL
Architects : Messrs. Tecton

their lovely tapering entasis and their delicate, beautifully-carved capitals. This makes them wonder what the architect to-day is doing.

For the very reason that the architect is striving after the means of expressing his mechanical environment does his work incline to simple line and mass. He no longer wants to copy forms expressive of other ages and as yet he has not to his hand anything to take its place. He has, so to speak, scraped from off his building all conventional ornament, and has left nothing but bare surfaces. The very word " ornament " makes him shudder.

I pointed out earlier in this lecture that styles grow by evolution rather than by active or conscious invention, so that it is only by the process of time that this

negative manner of building may be transformed into something that may be termed a style. Architecture would be poor indeed if it had to stand still at the point to which the modernists have reduced it, nude, primitive and bald. Humanity will not remain content with the bare bones of functionalism, however nearly it may meet the facts of our problems. Man cannot be satisfied with materialism, his spirit demands something higher than a mere working machine for the fulfilment of life.

There is no doubt that a new generation is asking for things that correspond with its own outlook and not with those that recall the craft of other times ; and so in the decorative arts and in the design of everyday things invention and play of imagination are at work. Taking furniture and textiles alone, the design is not now merely an exercise in copying and reproducing ancient forms and patterns.

Alongside this adventure in design has come a huge wave of scientific invention, the machine being its godparents. New materials and new methods in the building industry are numberless, and these are having a profound effect also upon architecture. Let us consider for a few moments the new uses of one or two of the most important of these new building materials.

Steel.—Long before the War steel was used in buildings in stanchion and beam, but its use for window and frame is comparatively new. Steel lends itself to mass production of units and its rigidity has enabled us to enlarge the window surface of buildings, in fact, if desirable, to construct them almost wholly of glass held in steel bars.

Reinforced concrete.—This is another application of steel, steel bars being introduced into the concrete. Concrete itself is as ancient as Rome but thus reinforced it has given us entirely new powers as applied to buildings. Supporting members can be reduced in size. Walls can be reduced in thickness. Great spans can be covered. New forms of construction in post, beam and flat roofing have been made possible.

New uses of wood.—Plywoods and laminated woods are made possible by machine processes. They have quite different properties from wood used in the old way and have revolutionised the design of furniture and joinery. In plywood the tree is first cut into thin layers, which are glued together again with the grain running in opposite directions. The shrinkage inherent in wood is thus minimised. In laminated wood the core consists of narrow strips glued together and surfaced on both sides with a veneer. A manifold variety of attractive woods brought from the ends of the earth are also now available for decorative purposes.

New forms and new applications of other materials, such as glass, rubber, asbestos and cellulose paint, have been brought to the building industry and are influencing architectural design.

The architect, freed from the shackles of designing in a past style, has to his hand all these new materials and new ways of using them. He is at the same time confronted with many social changes, making new demands on planning and organisation. Is it to be wondered at that architecture to-day is dressed in many guises ?

The material that has chiefly caught the imagination of the new world is reinforced concrete. Here is something that has properties fundamentally different from those of the older methods of building. Instead of the main structure being built up of a great number of small separate pieces of material stuck together by mortar or cement, it is moulded into shape by running liquid material into forms, and the finished article is a monolith. Now it must logically follow that a true reinforced concrete building, if it is going to express its real qualities, is not going

TOWN HALL, HORNSEY. Architect : Reginald H. Uren, F.R.I.B.A.

to resemble any building of the past. To present this concrete structure in seemly form is one of the problems for the architect to-day. What is he doing with it ? Some would have it left in all its naked engineering ; others are trying to clothe it in a way that may express the underlying idea. The results so far are mostly bleak and barren. The skeleton is there, but the flesh and skin are lacking.

So exciting is it to find a material with new possibilities that it is small wonder that some designers are inclined to lose their heads. A material eminently suited to the spanning of large spaces in factory, cinema, church and hall is being used when ordinary construction would be more serviceable and economic. Because with it we can eliminate the supporting wall and can construct easily the flat roof, some

would persuade us that our climate is more delectable than it is; that to live in a glass house and sun bathe on the roof are desirable under every circumstance, although we have long found the glare in the conservatory unpleasant, and the close proximity of the suburban house unpropitious for the sequestered sun-bath. The flat roof is no new thing, but the old builder found that in our wet climate the pitched roof threw off the rain more quickly. The pitched roof, too, gives insulation between our living rooms and the heat of summer or the cold of winter; it makes room for tank and boxes in its stride; whereas with a flat roof elaborate and expensive arrangements have to be made to meet these needs.

I came across an article the other day written soon after new methods of casting iron brought it into industrial use. This article was lyrical on the marvellous properties of cast iron; it would supersede everything else and would fulfil not only our humble needs in garden seat and public convenience, but whole buildings, with staircases, columns and domes, would flow from the heated metal. The recollection of market hall, church gallery, pier-pavilion or bridge, the products of this enthusiasm, may make us thankful that the vogue was not prolonged.

Are we not at this moment in the same state of mind with regard to reinforced concrete? Shall we not later realize that it has added one more weapon to our armoury for attacking certain problems, but that it has limitations, and that stone and brick still have their place and right uses? I myself believe that unadorned concrete is not going to satisfy us for the surface of our buildings any more than it did the Romans; and to cover it with plaster is but a poverty-stricken expedient, unsuited at any rate to the town or to buildings of any importance. As soon as its slick whiteness and newness fades, it wears a bedraggled, shabby and squalid look. To my mind it is only when a pleasing and economic material is devised that can be used as a permanent shuttering, that concrete will come into its own as suitable for fine building.

I might enlarge on the fashions of the moment. First, the sheer box-like walling, without drip-course or overhang, though the builder of the past used these to throw the wet from his wall. Secondly, the line of solid balcony, to give a horizontal effect, often too narrow for use, taking sun from the windows below and ignoring the real charm of the balcony, which is to allow the windows to run low to the floor and give a widened outlook. Thirdly, the window that bites the corner out of the building, on occasion a legitimate means of lighting or of seizing a particular view, but restlessly destroying the sense of stability if used to excess, and, when adopted in brickwork, no more than a sensational stunt.

In spite of excesses, fashions and absurdities, I am wholeheartedly in sympathy with the spirit and idea that informs the best of modern architecture. For it recognizes the machine and its possibilities of repetition and mass production; it recognizes that the slick and mathematically true surface of machine-made material can produce a quality of its own.

Properly disposed mass and form rather than elaboration or ornament are the qualities on which good examples of modern architecture have to depend. They

CHURCH OF ST THOMAS THE APOSTLE, HANWELL
Architect. Edward Maufe, F R I B A

appear to be clean-cut by the machine rather than by the work of man's handicraft. Inside the building the tendency is towards openness, directness, and a sense of space. As the mechanical works of a building, in electricity, heating and ventilation, become more complicated, so does the outward appearance tend to become more simplified and direct, appropriate in an age in which labour-saving and cleanliness are the ideals.

But in the very freedom that we have attained lurk dangers. The old accepted ideas of style and proportion by which architecture was measured no longer hold. The rules are relaxed ; we have to beware of the charlatan and stunt-monger who play upon the human desire for novelty and strangeness.

It is perhaps the genius who will evolve from the negative tendencies of to-day a fine and growing style for the future, but it is more likely that this evolution will come through the work of architects, who, endowed with common sense, at the same time have a full knowledge of the newer materials and their possibilities. Here in England it seems to me indispensable that they should be steeped also in English traditions of building, and that only by knowing and fully realizing how skilled the old builders were in their craft can they carry the art of architecture forward. The idea that to be modern and create a new style it is better to know nothing about the old traditional styles is mere folly. If English architecture of the future is to have character, as our buildings in the past had, it must have that native graciousness that made our architecture a thing bound up with our character, our climate and our countryside.

DISCUSSION

THE CHAIRMAN, in opening the discussion, said :—I would mention one or two points which occurred to me during the lecture, which may give you ideas for debate. The first is that England has the glory of initiating the break from the pompous style of the nineteenth century. Through the teachings of Ruskin, William Morris and Lethaby there developed a form of architecture which was different, and eventually Mackintosh, Harrison, Townsend and several other architects began to influence continental design. The Germans very quickly caught on to the new ideas, and they were followed by the Austrians. In the work of Otto Wagner we see the reaction against nineteenth century tradition. The process continued through German experiments until just before the War. Then came *der Tag* with its bombshells, when the whole world started designing munition factories and architecture was almost forgotten. The repercussion after the War was terrific. Architects said they could dispense with ornament and would, at all cost, devise something new. On the Continent the new movement went ahead at a furious pace, and finally its productions were discovered by English photographers. We are now getting the reflex of the movement we initiated. We are accepting our own ideas at second-hand, as we always do, and we do not understand them in their new order. This afternoon a book was sent to me from Japan to show that Japan has succumbed to the fashionable movement, including copying jerry-building. I found one design marked " A small talkie." Why should we English not try to escape from the mechanical age ? Why must we succumb to it ? The very juggernauts which we try to avoid in our daily walks are said to be worthy of imitation. Why is the worship

of the machine so characteristic ? Why must our buildings look like fragments of liners or portions of aeroplanes ?

In Sweden there has been a great advance on sound lines, following the teachings of Lethaby. The Swedish architects almost alone among their colleagues have admitted the theory that in art there is no advance, only return. In Russia a similar procedure is going on at the moment. The new regime not only encourages barter for cash, but advocates a return to a study of the underlying principles of the arts. Russian architects and professors are now investigating the guiding principles of architecture with a view to continuing great basic truths.

Regarding substitute materials, such as plywood, I can say that I have been tearing down plywood infested with beetle, and dread to think what will be the ultimate fate of important buildings which are lined with this material. The beetle cannot get into concrete, and that seems to be a great pity !

MR. DARCY BRADDELL, F.R.I.B.A., said :—One cannot help turning round and saying to one's self, " Have we really progressed ? " Is there any real advance in the art of architecture to-day from that of twenty-five or thirty years ago ? Certainly we are faced with different conditions, brought about partly by the necessity for economy, and partly by a feeling of change, and naturally revolt, from all pre-war values.

For one thing we are faced with the question of the flat surface. It is the desire to use this which is changing so much modern design. In my own opinion it is a poor desire, because it is so difficult to construct. The functionalist says that to construct satisfactorily he wants a flat surface because it is easily cleaned, and a lot of other nonsense of that type which he does not really believe. The flat surface is used by him not for functional, but for æsthetic reasons. This explains his continuous use of balconies. He is up against the problem of the flat surface, and as he denies himself the pleasure of ornamenting it as his ancestors did, he must do something else. He therefore falls back on the use of long balconies and makes them solid so that they will cast shadows and so break up his design. He is not concerning himself with the functional use of balconies, but with the problem of making a flat design look interesting. I think most practising architects to-day will support me in my contention that this passion for flat surfaces is doing a lot of harm, because it is being carried on to excess. Why should we throw away all the pleasure of ornament ? Why should we deny ourselves the delicate light and shade which it gives to buildings and substitute for it a series of flat planes constructed of materials which are not meant to be used in large unbroken masses. As a case in point, anybody dealing with plaster in this manner knows quite well what a time he may be in for a few months after his job is finished.

Mr. Milne referred to simple massing as being the proper answer to good modern design, but I would point out that the two examples he chose were a church and a town hall, each of which gives obvious opportunities for massing ; but when we were shown large blocks of flats where every inch of ground had to be covered, what did the designer fall back upon ?—balconies.

MR. HECTOR O. CORFIATO, S.A.D.G., A.R.I.B.A., said :—I should like to raise one point, that of prejudice in design, prejudice arising out of fashion. This was the spirit which moved Petit-Radel to propose that all Gothic cathedrals in France should be remodelled in the Renaissance style at a low cost. This fight between the old and the new existed at the time of the erection of the cathedral at Milan, when according to contemporary historians the old refused to die and the young were

impatient to see the birth of a new art. Nowadays this prejudice in design makes architects believe that they are not modern unless they have horizontal windows in their designs, even if the construction has to be faked in order to make the buildings appear functional. " Functional " is a tricky word, but it shows the prejudice arising out of environment. A similar prejudice existed even at the time of Wren, for when he carried out the restoration of the mausoleum of Halicarnassos he introduced columns and festoons of the Renaissance period. That is what, to my mind, is prejudice in design, and I think it may be of interest to the discussion.

MR. J. S. WILSON, F.C.G.I., M.Inst.C.E., said :—Mr. Milne, in referring to the introduction of cast-iron, mentioned a point to which I had called his attention at some time. In reading early reference to cast-iron I have always been struck by the similarity between the enthusiasm there was over that material and the later enthusiasm for reinforced concrete. So much more can be done with reinforced concrete than with other materials that almost all who start to use it succumb to the temptation to show off. Early users of cast-iron might not have been so fascinated by the novelty of the material had they been aware of the much earlier castings made in China. The figure of the Temple Guardian, Sung Dynasty (960–1279 A.D.), in the Exhibition of Chinese Art, is a remarkable example.

Mr. Milne referred to the smooth surface in large flat expanses and long strips so much in vogue. Although those forms may appeal to some, nothing of the kind occurs in Nature, and suitable materials for their construction do not exist. The expansion and contraction of all substances by heat invariably divides the large areas and long strips into smaller pieces by cracks. A long continuous wall or roof built of modern highly resisting material always develops unsightly cracks and the ends get pushed out of shape.

MR. G. E. CASSIDY said :—I should like to add a word as one of the younger members of the audience. I feel myself rather bewildered by Mr. Milne's remarks on the subject of modern architecture. He is rather scathing in some ways, with possibly good reasons, but I wonder if, for the sake of the younger architects, the more experienced gentlemen could tell us exactly what they think we ought to do about it in the circumstances ?

MR. WALTER E. CROSS said :—The last speaker has asked a very great question and one to the point. It is very easy, as he remarked, to be scathing of anything new, but I think we can include other subjects and phases of life besides architecture in this " revolution." Art and science and religion, everything is constantly changing its aspect, and even with our modern speed we are, if I may put it in a nutshell, like children with new toys which are apt to be played with excessively. So it is with this experimental stage, and with reinforced concrete design. The lecturer has put it in the only way in which it can be put. The skeleton of the new created thought is there, but it must ultimately be clothed to give satisfaction and the finenesses which make life worth living at all. That is all we can do—give it a chance, realise it is a new toy and hope that it will evolve itself satisfactorily.

MR. WILLIAM WALTER WOOD, F.R.I.B.A., said :—I speak as the despised author of one of those modern buildings we have seen on the screen. I was hoping somebody would stand up and defend me, but apparently I must do it myself. I suppose I may rank myself as a functionalist. I do not like the word " functionalism," but it has been used a good deal this evening, and I will use it. I do not think we are necessarily tied to concrete or to brickwork or to stone or to anything else. I think the modern

architect—and by that I mean the man who tries to look economic facts in the face —is willing to use any materials or methods to get the most satisfactory solution of the problem with which he is faced.

As regards the functional question, let us look at any other example. Take the penguin pool at the Zoo—a reinforced concrete structure and a delightful one. The penguins like it, and they know what to do with the ramp. Would they have been so happy if this had taken the form of a traditional flight of steps ? Surely that would have been more suited to the monkey house.

I feel that we are entitled to a little more sympathy, and an attempt, I think, might be made to see our point of view, which is that we try to give light and air and comfort, and if we do not put ornament on, it is usually because we cannot afford to do so.

THE CHAIRMAN said :—Speaking of the penguin walk, I would remind you that the penguins had to be trained for six or seven weeks before they understood it ! The keepers had a very busy time, and eventually they managed to get the penguins to go the right way by sprinkling food before them.

The question raised by Mr. Cassidy as to a possible solution will be found in the suggestion that architecture should be 10,000 men deep, and not one man deep. In other words, the work of nations and of centuries, and not of individuals and days in offices. Neither will it arise at the demand of newspapers, either here or abroad. The erudite address of Mr. Milne sums up the situation very concisely, but neither he nor myself nor anybody living can find a way out of the maze. The solution will probably result from the activities of small communities and in the revival of staple industries such as agriculture, not from the centralisation of industry, which has proved such a curse in America. Decentralisation of population does offer a way out. The adjustment of the balance between extremes of ideals is also an important matter. We must compromise between certain lines of development. It is in the English nature to compromise. What might be termed the contest between the pictorial and the strictly utilitarian is foreshadowed.

I should have liked to hear more about that snare of art, fashion. The lecturer has shown himself in the role of *arbiter elegantiarum.* Fashion is a dishonest jade, a lipstick person, a shameless hussy who causes ordinary mortals to lose their heads. The fashionist tries to keep up appearances, and expresses himself in terms of exaggeration. It is thought to be a clever thing to spring something new on a dull and weary world. It is fortunate that the fashionist is not allowed to do it more than once. In plain truth the originator of a fashion is dangerously near the status of a charlatan ; the ordinary seeker after notoriety is content to be merely in the running. The runners-up are the worst, because they imitate or travesty the fashion. It is not curious that the man-in-the-street distrusts the unfamiliar aspect of new buildings. He knows that the real test for art is its intelligibility to the ordinary eye.

Mr. Milne seems to hesitate as to the necessity for accepting the mechanical environment in which we find ourselves. The artist in him contradicts his hesitation. He is an artist, and you will applaud him for seeking something more spiritual in contemporary architecture. The great purpose of art, throughout history, has been regard for proportion. The whole impulse of art has been to endow the work of the brain and the hand with the quality of permanence. The great national works of art of the land illustrate this. The most modern art is the Chinese, which has stood for 3,000 years. When the critics went to the Exhibition they were powerless to criticise the painters.

The chief trouble to-day is that we are all apathetic to anything that is not of

material advantage. We should realise that the future of architecture does not lie in the hands of individuals, but in the aims of the great human family. After all, art is but an expression of aspirations. The pseudo-scientific arty domino which covers the ugly skeleton of engineering to-day is not the real thing, it is a travesty ; it is a caricature, it is one of the Ugly Sisters. But Prince Charming is not going to be deceived by that.

I have no hesitation in saying that public opinion is worth having, and I advise architects to consider it. Instead of haggling over this or that in style, they should face the problem of jerry-building. They seem to delight in arguing as to whether a roof should be flat or otherwise. It would be better to tackle the real facts of ordinary building. We have no vernacular to-day, only the work of the speculative builder, which represents a travesty of the Gothic revival. It is the poor person's idea to be respectable, to be English—and the poor person who is fobbed off with leaded windows or sham gables is being deceived. And so is the man who asks for a good house and gets one that is merely modern-looking.

It is extremely difficult to encourage students to understand the rudiments of the art. They want to branch off too quickly. Fashion is doubtless the mark to be guarded against. There is a very vigorous architecture springing up in England to oppose this. At present it appears in out-of-the-way places ; but I see the beginnings of something very fine, and eventually we shall be in a position to compete with foreigners.

It is my great pleasure to ask you to accord Mr. Milne a really appreciative acclamation of thanks for his courageous paper.

THE LECTURER, in reply, said :—Thank you for the kind way you have received my remarks to-night. I gather that I conveyed meanings that I did not intend. Professor Richardson's remarks show that he does not like these modern new materials, and he seems to link me with that dislike of them. I do not feel that at all. We have got to use them, and we are experimenting with them. I seem also to have given the impression that I despised some of the buildings of which I showed slides. I did not mean to give that impression, but simply to illustrate my points clearly.

I hope I did make the point that architects at this moment are experimenting to try to meet the new conditions of our life. Some functionalists I do not quite understand. I am much interested in what they are aiming at, but I think they sometimes do things, no doubt with an idea behind it, but with a lack of common sense. In time we shall develop an architecture which will reflect our machine age. Difficulties are there, as Mr. Wilson pointed out, while we are trying to evolve a style which will express life as it is to-day.

NOTES ON BOOKS

INDUSTRIAL ARTS. Number I. Edited by Bertram Evans. 2*s*. 6*d*.

This new " Magazine of Applied Arts in Manufacture and Marketing " is to appear every quarter. It is on a sumptuous scale and has many illustrations in colour, and the advertisers at front and back have provided impressive copy in conformity with the high ideals implicit in the enterprise.

A new magazine of the sort is justified, both by recent developments in the public taste and by the likelihood that a still wider interest will soon be general in better

design in industrial art. The editor's difficulty is going to be selection. For it is not only fine art that involves philosophy, history, psychology—everything. And it is not as if modern art in practice was as simple as the theories which are still put forward to prove its respectability. Modern art is really a kind of art, that is all—and that is a great deal.

Some of the contributors to this first number are doctrinaire, but by no means all of them. Mr. Norman Bel Geddes' streamlined ship is a logical ship, quite a handsome ship—rather an enclosed ship. There will be ships like that. Why does the writer who describes it talk about " the heavy hand of the past " ? Without the past there would be no present. Past errors lead to present trials. Ruskin thought perfection a bore, and rather dehumanising into the bargain. Fundamentally, technical progress is more exciting intellectually than artistically or socially.

Mr. R. H. James writes an article on modern industrial propaganda in which he warns us to be on our guard against the absurdities of the newspaper and the hoarding. He also takes illustrations of the insidiousness of propaganda from the past: especially from famous pictures which helped to disseminate true and false conceptions of social values. His moral is excellent, but, as everything that everyone does or says with conviction is propaganda, he might have added that education ought to inculcate scepticism more efficiently than it does. There might be counter-propaganda classes once or twice a week. Not that detection of motive presents many difficulties where commercial propaganda is concerned. The motive is to sell as many as possible of the goods advertised. There must also be more education of taste.

Among other interesting contributions to this number is a set of Blossfeldt's photographs of plant forms, an article on French surrealist bookbindings, and one on the calligraphy of Victor Hammer.

THE ROYAL ACADEMY. By W. M. R. Lamb, C.V.O., M.A. London: Alexander Maclehose and Co. 6*s*.

Mr. Lamb's excellent handbook deals with the rise and development of the Royal Academy, whose secretary he is to-day.

Three hundred years ago, in 1636, our patron king, Charles I, founded a Museum Minervæ, but the Commonwealth did not see fit to prolong the life of this institution. During the Restoration period John Evelyn formulated a plan for an academy of arts ; it came to nothing. Sir John Kneller's academy was an art school ; so were Thornhill's academy and Hogarth's " Academy for the Improvement of Painters and Sculptors by drawing from the Naked." The wealthy Dilettanti Society could not bring itself to come to terms with the professional artists' association, but the Society of Arts was more helpful. A free public exhibition was organised at the Society's rooms in 1760, and the artists raised money by charging sixpence for the catalogue. In this way they got more than £300. Five years later the Society of Artists was incorporated, and three years later came the foundation of another body, this one destined to endure—the Royal Academy.

King George III had not been altogether well disposed towards Reynolds, because this great man never acted on his friend Johnson's belief that the first Whig was the Devil. But when it came to appointing a President for the new Academy there seemed a good deal to be said for having a man who was in with the important people of both political parties. Reynolds remained President for about a quarter of a century—so far the chief ornament which this distinguished society has had. It was an auspicious beginning ; and Dr. Johnson was the first Professor of Ancient

Literature, Goldsmith the first Professor of Ancient History, and Boswell (the friend of Rousseau and Paoli !) the second Secretary for Foreign Correspondence.

The business of the Academy was to provide teaching, to house a permanent collection of art, and to organise exhibitions, the first and last of which functions it continues to perform to this day, the second having devolved on the National Gallery and other bodies in the meantime. Mr. Lamb tells the story in full detail, leaving out nothing, not even the scarlet cloaks worn by Academy porters on special occasions.

It would be hard to exaggerate the influence the Royal Academy has had in raising the status of artists in this country. What it is doing for culture generally is now known all the world over. The present winter exhibition at Burlington House is the seventh of an international series of unsurpassed interest. P. B.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, APRIL 20..Aeronautical Society, Royal, at the Institution of Electrical Engineers, Savoy Place, W.C. 6.30 p.m. Dr. H. J. Gough and W. A. Wood, "**Strength of Materials.**"

Electrical Engineers, Institution of, at Armstrong College, **Newcastle-on-Tyne.** 7 p.m. Dr. R. J. Reynolds, "**Cineradiography.**"

At the Cleveland Technical Institute, **Middlesbrough.** 6.45 p.m. S. Burns, "**Change of Frequency.**"

Mechanical Engineers, Institution of, Storey's Gate, S.W. 6.45 p.m. A. C. Murdoch, "**The Development of Automatic Refrigerating Plant.**"

Victoria Institute, at the Central Hall, S.W. 4.30 p.m. G. R. Gair, "**The Races and Peoples of the Early Hebrew World : a Study in Ethnology.**"

TUESDAY, APRIL 21..Anthropological Institute, Royal 52 Upper Bedford Place, W.C. 8.30 p.m. H. D. Skinner, "**Maori and Polynesian in the Light of Recent Archæological Work.**"

Civil Engineers, Institution of, Great George Street, S.W. 6 p.m. Prof. J. F. Baker, "**The Rational Design of Steel Building-Frames.**"

Mechanical Engineers, Institution of, at the Royal Metal Exchange, **Swansea.** 6 p.m. F. G. Smith "**American Sheet and Tinplate Rolling Practice.**"

Photographic Society, Royal, 35 Russell Square, W.C. 7 p.m. W. L. Shand, "**Avignon, Arles and the Alpes Maritimes.**"

Sanitary Institute, Royal, 90 Buckingham Palace Road, S.W. 5.30 p.m. Dr. E. K. le Fleming, "**The Problem of Physical Education in Schools.**"

Transport, Institute of, at the Institution of Electrical Engineers, Savoy Place, W.C. 6 p.m. R. Bell, "**Transport Developments in 1935.**"

WEDNESDAY, APRIL 22..Chemical Engineers, Institution of, at the Chemical Society, Burlington House, W. 6.30 p.m. Dr. D. M. Newitt, "**The Design of Vessels to Withstand High Internal Pressure.**"

Folk-Lore Society, at University College, Gower Street, W.C. 8 p.m. W. F. J. Knight, "**The Initiation Pattern.**"

Geological Society, Burlington House, W. 5.30 p.m. Dr. S. H. Hudson, "**The Volcanic Rocks and Minor Intrusions of the Cross Fell Inlier.**"

Mechanical Engineers, Institution of, at the Grand Hotel, **Sheffield.** 7.30 p.m. J. S. Merry, "**The Corrosion of Boiler Metals.**"

Psychological Society, British, at 11 Chandos Street, W. 8.30 p.m. Dr. M. B. Wright, "**Thirty Years of Psychotherapy.**"

THURSDAY, APRIL 23..Chemist-Analysts, Institute of, at the Royal Society of Arts. 7.30 p.m. The Marquis of Tavistock, "**Modern Economic Proposals as an aid to Scientific Progress.**"

Electrical Engineers, Institution of, Savoy Place, W.C 5.30 p.m. J. D. Cockcroft, "**The Transmutations of Matter by High-Energy Particles and Radiations.**"

Engineers and Shipbuilders, North-East Coast Institution of, at the Cleveland Scientific Institution, **Middlesbrough.** 7.30 p.m. R. L. Quertier, "**Modern Developments in Air Compressors and in the Use of Compressed Air.**"

Imperial Institute, South Kensington, S.W. 2.30 p.m. C. E. Smith, "**Canada -A Trip to Ontario.**"

Linnean Society, Burlington House, W. 5 p.m. Capt. F K. Ward, "**A Sketch of the Vegetation and Geography of Tibet.**"

Locomotive Engineers, Institution of, at the Institution of Mechanical Engineers, Storey's Gate, S.W. 6 p.m. S. I. White, "**The Value and the Necessity of Locomotive Consulting Engineers.**"

Marine Engineers. Institute of, 85 The Minories, E.C. 7 p.m. J. H. Wheadon, "**Marine Superheaters.**"

Mechanical Engineers, Institution of, at University College, **Southampton.** 7.15 p.m. J. Johnson, "**The Future of Steam Propulsion.**"

FRIDAY, APRIL 24..Engineers, Junior Institution of, 39 Victoria Street, S.W. 7.30 p.m. H. M. Taylor "**Granite Working Processes and Machinery.**"

Engineers and Shipbuilders, North-East Coast Institution of, at the Mining Institute, **Newcastle-on-Tyne.** 6 p.m. R. C. Thompson, "**Modernizing the Motorships 'Silverlarch' and 'Silverpine,' and increasing their Service Speed**"

JOURNAL OF THE ROYAL SOCIETY OF ARTS

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

MEETINGS OF THE SOCIETY

NEXT WEEK

MONDAY, APRIL 27TH, at 8 p.m. (Cantor Lecture). REGINALD E. STRADLING, C.B., M.C., D.Sc., Ph.D., M.Inst.C.E., Director of Building and Road Research, Department of Scientific and Industrial Research, "Problems of Road Research." Lecture II. (Illustrated by lantern slides.)

TUESDAY, APRIL 28TH, at 4.30 p.m. (Dominions and Colonies Section). SIR LOUIS SOUCHON, C.B.E., Representative in London of the Mauritius Chamber of Commerce, "Mauritius." (Illustrated by lantern slides.) LIEUT.-COLONEL SIR JOHN CHANCELLOR, G.C.M.G., G.C.V.O., D.S.O., R.E., will preside.

Tea and coffee will be served in the Library from 4 p.m.

WEDNESDAY, APRIL 29TH, at 8 p.m. (Ordinary Meeting). SIR HERBERT MATTHEWS, "The Problem of Wheat Supplies in Time of War." THE RIGHT HON. LORD PHILLIMORE will preside.

PROCEEDINGS OF THE SOCIETY

DOMINIONS AND COLONIES SECTION

THURSDAY, 27TH FEBRUARY, 1936

THE RIGHT HON. VISCOUNT ELIBANK in the Chair

THE CHAIRMAN, in opening the meeting, said: It gives me great pleasure to accept the invitation to come here to-day to preside at an address to be given by my old friend

and parliamentary colleague, Lord Bledisloe. Lord Bledisloe has performed many distinguished public services, and not the least among them was that performed by him as Governor-General of New Zealand. During his term of office, as we know, he made every detail of New Zealand life his special interest, and that is perhaps why to-day we find him reading a paper on the Maori race, which will no doubt be full of knowledge and experience of this remarkable native people.

It was Lord Bledisloe—and here I have to add the name of his charming lady—who marked their term of Governor-Generalship by presenting to the New Zealand nation the residence and some 2,000 acres surrounding it of a place named Waitangi, where the bond of union between the Maoris and the British people was formed and signed just under one hundred years ago. This was a munificent gift and a very gracious act, which I am sure will never be erased from the memory of New Zealand or from the pages of her history.

I personally know very little about New Zealand. I have never had the opportunity or the honour of visiting that wonderful Dominion of the British Empire, but I hope to do so this autumn in connection with the Triennial Congress of Chambers of Commerce of the British Empire, of which I have the honour to be President, and that is perhaps one of the reasons why my friend, and the Society, asked me to preside to-day. But who in the British Empire, indeed, in the world, has not heard of the Maori race, of their courage, of their good qualities, of their loyalty to the original pact which they signed at Waitangi, and of their loyalty to the King and Sovereign ? About them and their customs and their aspirations we hope to hear from our distinguished lecturer to-day, and I propose no longer to stand between you and him, but to ask him to address us.

The following paper was then read :—

THE MAORI PEOPLE

By The Right Hon. Viscount Bledisloe, P.C., G.C.M.G., K.B.E.

Late Governor-General of New Zealand

Five years' sojourn in New Zealand as the Representative of our late revered King has left me with the profound conviction that the Maori people, the most interesting, the most attractive and potentially the most civilisable of all the so-called " native " peoples of the world, have reached a crisis in their history, which, in the absence of greater understanding and sympathy on the part of their British fellow subjects may eventuate in their irretrievable decadence, if not their racial obliteration. Hence the choice of my address to you this evening.

At the beginning of the nineteenth century they owned, on a communal basis, the whole of the land of what constitutes to-day the most distant and most delectable Dominion of the Crown, they were (in spite of cannibalism) a noble, proud and accomplished community and numbered probably a quarter of a million persons belonging to numerous tribes. To-day they own a mere fraction (possibly one-tenth only) of the land of their forefathers, and their numbers, although greater than at the beginning of the present century, do not exceed seventy thousand, among whom, moreover, the percentage of those having in their veins European blood is large and is increasing.

Let me summarise very briefly their history and characteristics. They are a section of the Polynesian race which is spread over numerous islands in the Eastern Pacific. They appear to have come to New Zealand in several batches of canoe-voyagers, commencing as long ago as 1150, the last arriving, probably from Tahiti *via* Rarotonga (the chief of the Cook Islands), about two hundred years later. They were divided into some twenty or thirty tribes, each with its own territory and tracing kinship to some common ancestor and to an ancestral arrival on New Zealand shores in some particular historic war canoe such, for instance, as the Tainui, the Arawa, the Matatua, the Tokomaru, or the Aotea. Each tribe consisted, and still consists of several different *Hapu* or clans, numbering in olden times approximately a thousand warriors. The highest chief or Ariki was omnipotent in tribal government, his *mana* (or prestige) was venerated, and as a rule he fully merited the respect and obedience shown to him.

They lived in villages (*Kainga*) protected generally with a *pa* or fortified position nearby. Their domestic life, when not engaged in inter-tribal warfare, was simple, highly domesticated and embellished by the arts of carving, weaving, dancing and singing, in addition to the land cultivation, fishing and snaring requisite for their physical sustenance. In the warm climate of the North, the kumara (or sweet potato), and in the South, the edible rhizome of the bracken (*pteris esculenta*) formed their staple food, together with various tree fruits, snarable birds, the native rat, eels and shellfish. In place of the tappa (or flimsy cloth made from the bark of the paper mulberry) employed by the Polynesian Islanders in making clothes, they wove the harakeke, the so-called " New Zealand flax " (*phormium tenax*), most skilfully into warm and beautiful garments of varied description, as well as into plaited mats. Their houses (*whares*) were small and inconspicuous, but of artistic design, while their storehouses (*patakas*) and their tribal meeting house (*Wharerunanga*) were elaborately carved and painted and were by far the most beautiful structures in the Pacific Islands.

Probably no native race has a higher average of good physique and facial attractiveness. We are much beholden to the skilful New Zealand artist, Mr. C. F. Goldie (some of whose remarkable Maori portraits have appeared recently in the Royal Academy), for preserving for the benefit of posterity the striking facial characteristics—as well as the typical old tattoo markings—of the best types of the native people. The women of some of the tribes (especially those with no trace of Melanesian contact) are beautiful as well as graceful, and several of the men are of noble and refined appearance, displaying evidences of intellectuality and capacity for leadership which have always characterised their outstanding chiefs. As a race they are cheerful and have a keen sense of humour.

All their activities and interests were governed by their communal mode of life and outlook, and this was conspicuously displayed on the occasion of *huis* and *tangis*, the former being festal gatherings and the latter being the prolonged ceremonial of tribal mourning when the death of a leading tribesman occurred. War was their chief occupation—one might almost say their chief pastime—and the smallest

personal or tribal slight or discourtesy afforded an excuse for its inception. The men were highly trained in the use of weapons, and in their eventual battles with Europeans they displayed remarkable proficiency in the military art.

Cannibals they undoubtedly were, but they never hunted human beings for food (as in the case of some native races), and only ate the flesh of a conquered foe because by doing so they believed that they derived from it his physical strength, and in order to emphasise their contempt for his prowess.

Except that they have abandoned cannibalism (which, curiously enough, was associated with a high degree of culture and refinement) and have become under European influence less warlike, somewhat less industrious, less skilled in their characteristic handicrafts, and more hygienic in their domestic *ménage*, their mode of life has not changed very materially during the last century.

In religion, Christianity long ago superseded the strange admixture of reliance upon the spiritual influence of ancestors and that of various guardian deities of the forest trees and birds and other natural products and phenomena. It has, however, assumed various forms, and at times has become strangely commingled with ancient native beliefs, developing occasionally, as in the case of the Hau-Hau rebellion of the sixties of last century, into dangerous and savage fanaticism.

It was in consequence of the lawlessness and immorality of European immigrants, mainly whalers, sealers and timbermen, and their unconscionable and greedy commercial exploitation of the natives in respect of their land and its produce, that, after seven years' establishment of a British Residency in the Bay of Islands, New Zealand became, ninety-six years ago, an integral part of the British Empire under the Treaty of Waitangi—a treaty signed by Captain William Hobson, the first Governor, on behalf of Queen Victoria and (with a few notable exceptions) by the paramount chiefs of the leading Maori tribes throughout the two Islands. The English missionaries (foremost among them Archdeacon Henry Williams) who alone knew the language, appreciated the mental outlook, and enjoyed the confidence of the native race, were the main agents in persuading the Maori people to cede the sovereignty of their country to the British Crown, the Queen on her part guaranteeing to them "the full, exclusive and undisturbed possession" of their lands, except so far as the Crown might wish to purchase them, and in return extended to them all the rights and privileges enjoyed by British subjects. Forty-six chiefs of the warlike Ngapuhi tribe in the far north signed the Treaty at Waitangi on the 6th and 7th February, 1840, and copies of the Treaty were subsequently signed by over 500 others in different parts of New Zealand, each chief who signed receiving a red blanket and some tobacco. The main results of the Treaty, which the Maoris as a whole very imperfectly understood, were that it saved them from being robbed of their land at the inception of the process of British colonisation and, coupled with the invaluable influence of the missionaries (which had been operating for twenty-five years previously), prevented their racial extermination by intertribal warfare, a process which had been accelerated considerably by the introduction of firearms.

It is on behalf of these copper-coloured fellow-subjects of the British Crown—possessing as they do a combination of natural refinement (in spite of erstwhile cannibalism), dignity, warlike courage (coupled with Machiavellian chivalry), innate artistic taste, spirituality, generosity, hospitality, lovableness, and above all, sensitiveness to criticism and misunderstanding, to an extent unparalleled in any other native peoples of the world—that I am keenly anxious to evoke your sympathy and that of their other white co-partners in the British Empire.

In the following brief sketch of modern Maori history I have in large measure re-echoed the views of Professor J. L. G. Sutherland, admirably expressed in his recent pamphlet, *The Maori Situation*, published by Harry H. Tombs, Ltd., of Wellington, New Zealand.

The fate of the natives since the signing of the Treaty has not been altogether to the credit of our British administration or of the *Pakeha* (European) population of New Zealand. The " Maori Wars " of the 'sixties, precipitated by an act of land purchase which was manifestly inequitable, were to the native community a frantic struggle to retain the soil of their country and with it their national existence in exchange for civilisation and equality of status, but these were at that time not readily forthcoming. Their own tribal discipline and ordered ways of life were being upset. Christianity had overthrown their laws of *tapu* (or taboo) which they had obeyed in superstitious reverence, but no systematic attempt had been made to provide them with institutions to replace those which had been destroyed. The desire for a separate national existence, becoming increasingly passionate, culminated among the tribes of the Waikato in South Auckland in " the King movement " and spread for differing reasons to other tribes. It involved no real hostility to their white compatriots until the latter rendered it inevitable. It should have been met with sympathetic understanding, but was not. While acclaiming as " King " a paramount racial (as distinct from a tribal) chief, they never rejected the sovereignty of Queen Victoria.

Following the Maori Wars came confiscations of Maori land to the tune of nearly three million acres, confiscations which were wholly unjustified and, moreover, were unfair in their incidence. This for a time evoked on the part of the dispossessed Maoris bitter and fanatical hatred. One result was the emergence of the strange fanatical Hau-Hau movement, intended to be separatist both nationally and spiritually. Te Kooti was its outstanding and bloodthirsty prophet. The psychological, as well as the economic, effects upon the Maori people of this disturbance of inter-racial harmony were considerable and prolonged. " Rebels " and " Friendlies " alike became unsettled and disinclined to industrial pursuits. The King movement persisted, and indeed still persists, although now confined to the Waikato tribes, whose social organisation is centred around it, and who have until quite recently displayed a proud exclusiveness based on a smouldering sense of unfair treatment. The whole Maori population, conscious that their *mana* (prestige) was degraded, and instinct with a sense of impotence and inferiority,

suffered steady decadence in character, numbers, physique and enterprise until the end of last century, and seemed likely to become extinct.

During this period the great bulk of the land of New Zealand passed from Maori ownership to that of its white settlers. In 1865 the Native Land Court was established to determine the title to land that was for sale, " according to Maori customs and usages." Condliffe, the New Zealand economist, speaking somewhat critically of this Court (in his recent book *New Zealand in the Making*), says that " it has throughout the seventy years of its history been a means of facilitating the separation of the Maori from his land as equitably and as painlessly as possible," and in this way " it has been the chief mechanism in the break-up of Maori economy and the destruction of tribal order and discipline."

An Act of 1873 established the principle of *individual* title to land in spite of the communal nature of Maori land tenure. Pre-emption by the Crown was resumed in 1892, following the Report of a Royal Commission the previous year, which stated, *inter alia* :—

> " The alienation of Native Land under this law took its very worst form and its most disastrous tendency. It was obtained from a helpless people. They become suddenly possessed of a title to land which was a marketable commodity. The strength which lies in union was taken from them. The authority of their natural leaders was destroyed. Of all the purchase money paid for the millions of acres sold by the Maoris not one sixpence is left. A few more years of the Native Land Court under the present system and a few amended laws for free trade in Native lands and the Maoris will be a landless people."

But the anticipated extinction of this noble branch of the Polynesian race was not to be. Their survival, however, was not due mainly to British effort, still less to British appreciation of their vital needs. The *Pakeha* has, it is true, lent his aid in the matter of education and health services, but it is the Maori who has saved himself. His unanticipated " renaissance " has been achieved by leadership in an entirely new form which emerged from among the youth of his own race on the eve of the birth of the present century, originating in the Ngatiporou tribe of the east coast of the North Island and other tribes which had not clashed severely with British interests and claims. The advent of the Young Maori Party was due to the ideal of *Kotahi-tanga* or Maori national unity, as distinct from separate tribal organisation. It grew out of the Students Association of Te Aute College—the excellent Maori secondary school of the North Island. Of its members Sir Apirana Ngata, the late Native Minister, then a youth, was the outstanding speaker and organiser. He preached the gospel of work (based on practical education and loyalty to the best traditions of the race) as the sole secret of racial salvation and economic justification. To him, more than perhaps to any other single individual, is due the bettered condition and outlook of the Maori people during the present century. Other Maoris who lent their valued assistance in this *risorgimento*, both inside and outside Parliament, were Sir Maui Pomare (the eminent health reformer), Dr. Peter Buck (the learned ethnologist) and Sir

James Carroll (at one time acting Prime Minister of New Zealand) who, with British blood in his veins, was a great and successful conciliator between the two races and evoked a desire on the part of enlightened Parliamentarians to adopt measures of constructive value for the social amelioration of the Maori people.

Little, however, was done for their definite and permanent economic advantage (that is, to encourage and train the Maoris to become industrious settlers on their own lands) until Sir Apirana Ngata, in his own Ngatiporou tribe, bent his enthusiasm and amazing energy to this project about twenty-five years ago. This extremely difficult and complex task he has prosecuted, in face of much obstruction and misrepresentation, down to the present day. Time does not permit to explain in detail the compromise which he planned between communal and individual practices, through the processes of " incorporation " and " consolidation." Suffice it to say that the plan caught the imagination, and evoked the interest, of members of his own and contiguous tribes and rendered practicable and economically sound the adoption by the Maoris of modern European methods of farming. Ten years ago, after numerous new dairy holdings had been formed for the exclusive occupation of Maori farmers on the East Coast, the first Maori co-operative butter factory was built at Ruatoria in face of the outspoken criticism of those who discredited the possibility of Maori perseverance and business aptitude being forthcoming to perpetuate such an enterprise. It has to-day three hundred suppliers, nearly all Maoris, and its product has a high reputation in the London market, where it commands the top price given for the leading brands of butter.

During the last decade inter-tribal communication and co-operation have appreciably developed. There has grown up a racial consciousness that (as well expressed by Sir Apirana Ngata at one of their joint gatherings about four years ago) " the Maori world is to-day rich in men and women who by virtue of education, business experience, social position and a sense of patriotism, are deliberately tackling the problem of fitting their people into the present-day conditions of New Zealand." He went on to emphasise the value of their *hui*, *tangi* and feasts (often deprecated by Europeans as a waste of time and money) as occasions for the interchange of progressive ideas and ideals on the *Marae* (or tribal courtyard) or in the *Wharerunanga* (or meeting house). Following an epoch-making joint gathering at Whanganui in 1927 of the tribes of the East and West Coast of the North Island for the discussion of Maori welfare, two of the Maori Members of Parliament presented a Report to Parliament in which the following words appeared :

> " The Race has reached a stage in its development when young men, not soured by past tribal grievances, must get together and gather into a coherent, conscious organisation the fragmentary progressive attempts made by the Maori to fit himself into his present environment . . . Physically there is abundant evidence of a wonderful improvement. No visitor to any representative Maori meeting can fail to observe the health and vigour of the young generation, its pose and its self-confident bearing, the full cradles and the greater care of infant life . . . The latter-day

> Maori is throwing off the shackles of the past, looking little, if at all, over his shoulder . . . Socially he is fitting himself into the life of the country. The culture-complex that circles round the term " home " (in its English significance) has, with native modification, been adopted. With the loss of the greater part of their landed inheritance, the increase in population, the increased cost of living, the raising of the standard of life, and the weakening of the patriotic elements of the old-time communism, the Maoris of to-day are feeling the economic pressure with progressive severity. The feature of the day is the desire of the young people to work for themselves rather than be casual employees of others. Much of the pioneering work in the backblocks—bush felling, fencing, road making, shearing, draining, stumping and such like—has been done and is still being done by Maoris. That stage is now almost past in the industrial development of the Dominion. The younger Maoris are reacting on the already complicated Maori land problem and are demanding individualisation, consolidation, readjustment of occupation conditions and financial assistance. Naturally well endowed with brains, the success of a few in the highest schools is supplying fresh incentive and the motive of emulation. To-day no movement is capturing the mind of the best-thinking of the Maori youth so forcibly as that which aims, through the most suitable education, at preparing the Maori to take a fitting place in the life of the Dominion."

Thenceforth all the more intelligent of the young natives saw in the cultivation of their own lands the main hope for a self-respecting existence. There was also the spur of necessity. Actual stress has been compelling Maori communities to look to farming for their maintenance. Moreover, by the second decade of this century the clearing of the forest, road making and other pioneer work were practically finished, and the timber, kauri-gum and flax industries, which gave employment to many of the Maoris, were declining. They were thus faced with an economic crisis which, unless they were to become mendicants, rendered necessary productive effort on their own part for their subsistence. Maori farming of Maori lands was the solution, and under the enlightened guidance of Sir Apirana Ngata, who had then become Native Minister, legislation was passed in 1929 and 1930 providing for extensive schemes of native land development and giving the Minister wide powers for overcoming difficulties of title, breaking in uncultivated land, forming and equipping holdings with the help of public money, and selecting suitable units of the Maori people for the pursuit of modern husbandry under experienced supervision. By the middle of 1931 forty-one schemes in different parts of the North Island were operating or authorised. There are now about fifty. Three-quarters of a million acres are in process of development and more than 8,000 Maoris are provided for under the schemes.

Satisfactory though this is, it cannot be gainsaid that, nurtured under a communal system, the Maori as an independent farmer has so far proved less efficient than the European. He has not as yet developed the essential qualities of perseverance, commercial vigilance and thrift, and in all these land development schemes skilled European supervision has proved to be essential to success. The

difficulty has been to find European supervisors who can sufficiently enter into the Maori mentality as to be psychologically, as well as technically, equipped for the task. Of the work of Maori leaders in this economic enterprise none has been more conspicuous than that of "Princess" Te Puea Herangi, granddaughter of Tawhiao, the second Maori "King," and guardian of the youthful Koroki Mahuta, the present "King." A woman of noble character and great energy, she was herself in charge of the Waikato development schemes after purchasing back from *Pakeha* owners land previously confiscated from her grandfather.

It may be mentioned incidentally that the nationalisation in 1932 of the Waitangi estate in the Bay of Islands, including the site of the signing of the Treaty in 1840, evoked enormous enthusiasm throughout the entire Maori population of New Zealand, who regarded the Treaty, as they always have done, as their Magna Carta, the Charter of their inviolable rights; and on the 6th February, 1934, on their own initiative an historic gathering took place in front of the newly restored "Treaty House" (the old British Residency) in which representatives of all the tribes (including the previously recalcitrant Waikato and Urewera) participated, and in song and dance and perfervid oratory demonstrated their loyalty to the British Crown in the presence of myself as Governor-General, members of the two Houses of Parliament and many thousands of their fellow-countrymen of both races.

Most unfortunately, however, consequent upon the land settlement schemes, a blight has fallen upon the Maori people. In the report of the Controller and Auditor-General, presented to Parliament in December, 1933, a reference was made to apparent irregularities in the native land development accounts which eventuated in my appointing, on the advice of the Government, a Commission of Enquiry presided over by a Judge of the Supreme Court. In October, 1934, the Commission presented its Report which made it clear that serious irregularities had in fact occurred in the financial administration of the Native Department in consequence of the strain placed upon it by the initiation and over-rapid extension of the schemes of land development. Inevitably the main responsibility was imputed to Sir Apirana Ngata as its official head, and he had no option but to resign his office. It is unquestionable that the extensive powers originally conferred upon the Native Minister, dispensing with the safeguards usually adopted by Government Departments, and their exercise with impetuous haste, dictated by enthusiastic zeal for the economic welfare of his people, were the main cause of these irregularities.

In view of the supreme trust reposed in their political leader and champion, his sudden downfall, coupled with the extreme sensitiveness of the native race to anything savouring of suspicion or humiliation on the part of their *Pakeha* compatriots, has had disastrous effects, not only in retarding the progress of native land development but upon the whole spirit and *amour propre* of a proud people, ill-versed in the constitutional methods of Western European countries and not unmindful of past injustices. Sir Apirana Ngata himself from the outset

frankly admitted in Parliament his personal responsibility and the gravity of the disclosures contained in the Commission's Report, at the same time declaring (what was no doubt perfectly true) that in overlooking Departmental negligence he was obsessed with the *human* side of the problem which he had set himself to solve, to the exclusion of other considerations.

In the face, on the one hand, of widespread depression arising out of a racial inferiority complex and a deep consciousness of a lack of vision and non-appreciation of their mental outlook on the part of their white fellow countrymen, and on the other of a very real, although interrupted, renaissance (physical, spiritual and economic), the Maori people to-day stand at the parting of the ways. Ignorance of their language, their outlook on life, their distinctive, yet worthy, ideals, and the tendency, steady yet largely unconscious, to dragoon them into an undiscriminating *régime* based on the methods of Western civilisation, will inevitably eventuate in the effacement of all the nobler, self-respecting, idealistic characteristics of the race, with its typical graces and accomplishments and in its decadence from an economic position of proud, albeit lethargic, independence to one of mendicant servility. Those who a century ago were the dignified and warlike proprietors of the fairest and most fertile territory in the world, acclaimed under the Treaty of Waitangi as partners of equal status with ourselves in this princely heritage, are gradually becoming mere dispirited passengers in the national boat, unable (and not expected), to help in pulling it along, and regarded increasingly as a national encumbrance—a burden on the backs of the European population, a source of transient interest and entertainment to American, and other, tourists.

In the above review of the attitude adopted during the nineteenth century towards the native race by those in authority, as representing the early British settlers, it is only fair to recognise that if they were, as is now generally admitted, apathetic, if not definitely antagonistic, to the justifiable claims of the natives, it was due partly to a sense of insecurity in face of possible aggression, and partly to the fact that the white population was so engrossed with the difficulties of earning a livelihood in a new country as to be disinclined to study so complex a problem as the Maoris have proved to be. In the process of the so-called " civilisation " of coloured peoples by European races, history in this case was merely repeating itself.

If there is no colour problem in New Zealand, there is at least a colour consciousness. The Maoris cannot be Europeans, and all attempts to make them so should cease. The crying need of the moment is the strengthening of the newly-awakened confidence of the Maori people in themselves, keeping alive their racial pride and providing for them as full a life as possible, not as Europeans but as Maoris. The effort to make them self-supporting producers must on no account be dropped. It is essential to the maintenance of their self-respect as well as to their economic welfare.

But just as in their Christianisation they have been taught that " Man does not

live by bread alone," so care must be taken not to present to them commercial success as the be all and end all of their lives. Other factors are essential to the continuity and vitality of the race. Their agricultural activities must form the foundation of a social life characteristically their own. Otherwise, without developing into successful farmers, they will drift into becoming a white man's burden. In short, Maori problems are predominantly psychological rather than political or even economic. European ideas regarding money and property find no place in the typical Maori mentality. They have never been materialistic or acquisitive. They have never regarded the making and saving of money as the chief duty of mankind or the source of human happiness. They are generous to a fault. This generosity is well exemplified by their inclination to give away their most valuable family and tribal heirlooms to distinguished visitors from Great Britain and other countries, with the result that the Polynesian collections in New Zealand museums, although the best in the Southern Hemisphere, are not nearly so complete and representative as they ought to be.

The education of the highly educable Maori child in the 137 native schools has in the past been too much after the European pattern, has ignored Maori tradition and ideals and has disallowed the use of the beautiful Maori language —the language of the native home and the chief vehicle of native thought and sentiment. Fortunately, there has of late developed a tendency to include Maori tradition and Maori history in the school curriculum. But an increase of well-informed native teachers and the use of the Maori tongue are urgent desiderata. The revival of Maori arts and crafts, although embarked upon officially and sporadically a few years ago, needs far more enthusiastic and general encouragement than it has so far received. There is also great scope for improvement in the housing of the natives, as a means of improving their health standard. The Maori death-rate from all forms of tuberculosis is nearly ten times that of the European population.

As I have already indicated, the most notable features in the attempted renaissance of the Maori people during the last two decades have been on the one hand the tendency on the part of the more cultured section of its youth to favour their development along lines of Western civilisation, while at the same time remaining true to their own basic traditions and ideals, and on the other hand the successful reformative enterprise of a small group of leading Maoris, conspicuous among them being Sir Maui Pomare in the field of health and sanitation, Sir Apirana Ngata in that of economic progress and land settlement, and the "Princess" Te Puea Herangi (of the erstwhile intransigeant Waikato tribe) in the same sphere as well as in that of social progress and educational enlightenment. Simultaneously Dr. Peter Buck (Te Rangihiroa), the eminent Maori ethnologist, has done much to make the English-speaking world better acquainted with the history, the racial characteristics and the aspirations of the Maori people. It is the custom to bracket the native race and its *poi* dances, *hakas* and melodious singing with scenery and sport in advertising New Zealand to the travelling public. If the Maoris are to

retain their self-respect, it must cease to be regarded as their main or proper function to provide a picturesque show and entertainment for tourists.

The most profound mistake in British administration of Maori affairs in days gone by was the non-utilisation of the former *mana* or authority of the chiefs in the guidance and control of their respective tribes.

The lovely, mellifluous Maori language, each word of which ends in a vowel and which is so admirably adapted to the abounding and pregnant symbolism, pathetic melodies and expansive eloquence of the silver-tongued, soft-voiced Maori people, was half a century ago understood, at least in part, by no small section of their *Pakeha* (or European) compatriots. To-day it is known to very few, even in the rural areas of the North Island where the Maoris are most numerous. In the present New Zealand Parliament, apart from the four Maori M.P's in the House of Representatives, there are probably no more than three Members who can understand the simplest Maori sentence without an interpreter.

The Treaty of Waitangi promised equality between the two races, and to the then owners of the country " all the rights and privileges of British subjects." It should be made abundantly clear, not only that this promise will be faithfully fulfilled, but that it will be interpreted in a more generous and sympathetic spirit than of yore. Pathetic was the greeting with which the Maoris welcomed their Royal visitor, the Duke of Gloucester, at Rotorua a year ago :

> " We are troubled in spirit," they said, " and are wondering what will become of us in the days to come . . . Come then to renew that message of goodwill which Victoria gave her people, so that they may be assured once more of the mantle of protection which she spread over them, that the heart and faith of your Maori people may be strengthened."

Four years from now the centenary of New Zealand as a British possession and of the execution of the Treaty of Waitangi will come to be celebrated. May it be characterised by the confident conviction of the world's finest native race that their future is assured, that their equality of status under British sovereignty is unchallenged, and, above all, that their mental and spiritual outlook, so far as it is consistent with national progress and cultural development, is understood, recognised and catered for in national administration. It would, indeed, be deplorable if the British race who, a century ago, brought them new hope and enlightenment and saved them from mutual destruction should be the unwitting instruments, through ignorance or apathy, of their despair and ultimate racial obliteration.

It is because the Maori people of New Zealand—the most cultured, law-abiding, picturesque and lovable of all the native peoples of the world—are passing through a serious crisis in their history and development, and because a greater interest in and knowledge of them on the part of their fellow-subjects in Britain as well as in New Zealand are urgently needed if they are to maintain their prestige, their most alluring racial characteristics and their confident happiness, that I have made them the theme of my address to you this evening. I trust that I shall not have done so in vain.

DISCUSSION

THE CHAIRMAN, in opening the discussion, said : I am sure you will feel with me that we are deeply indebted to Lord Bledisloe for the most interesting and illuminating address that he has delivered to us this afternoon. It is an address of a nature that I have not often listened to, because he was able to introduce into it a little light stuff as well as the mass of information which he presented to us. I am sure that the tune with which he opened the proceedings gave us an initial insight into the Maori character—at any rate, it did to me, who have heard tunes of many native races in many parts of the world. Secondly, the photographs which were thrown upon the screen could not have better illustrated the life and conditions under which these natives live and under which they conduct their affairs. There is no doubt that, like all coloured races who have come in contact with a larger and more numerous white population, the Maoris have suffered, and of course we have listened with the greatest sympathy to the tale which Lord Bledisloe has unwound to us of the troubles and difficulties through which they have gone in past years. At the same time, I could not help feeling that as the period advanced, not only was the race consciousness of the Maoris being awakened, but the consciousness of the Europeans in New Zealand was being aroused to the necessity of giving a better deal to these Maori people. One cannot help feeling that an address such as has been given to us to-day will perhaps bring home not only to people in this country, but to the people of New Zealand, the Maoris' problems with which we and they are confronted.

In the course of his address Lord Bledisloe referred to the agricultural holdings that have been established for the Maoris, and the difficulty of obtaining instruction for them in agricultural farming, and I should like to suggest that that has been solved in other parts of the world by sending representatives of the native races to agricultural colleges, where they have obtained the latest and most scientific and practical training in the methods of carrying out agriculture under the conditions under which they live in their own places. I could not help feeling that, if it does not already exist, some sort of college like that might be started in New Zealand for that purpose.

I will now call upon my old friend, Sir James Parr, the High Commissioner for New Zealand, to say a few words to us on the subject of the address. On such an occasion as this the meeting would be incomplete unless he gave to us of his eloquence and his knowledge and experience.

THE HON. SIR C. JAMES PARR, G.C.M.G. (High Commissioner for New Zealand) said : I have had a most pleasant time listening to my old friend the ex-Governor-General of New Zealand upon a topic on which there is no one in this country better equipped to speak than his Lordship himself. I cannot quarrel, even if I were disposed to do so, with much that he said. I think his picture of the Maoris, his short history of that great people, was characterized by a remarkable knowledge, insight and, upon the whole, impartiality of treatment. Of course the Maoris love Lord Bledisloe and his gracious lady, who was particularly a favourite of theirs. His Lordship and her Ladyship did many wonderful things out in New Zealand in their term of office, but one of the things for which they will be never forgotten lies in this : that they put their hands in their pockets and found a very considerable sum of money wherewith to purchase the site of the Treaty of Waitangi, by which the Maoris came under the rule of Queen Victoria and the British Crown nearly a hundred years ago. The beginning of New Zealand's history was made when the Treaty was signed on this spot by the Governor and the native chiefs. As a New Zealander I am sorry to confess that we have been careless about the preservation of this spot, which saw the very beginnings of our history, and it was for our ex-Governor-General to remind us of our remissness

and by this practical and unusual generosity to bring us back to some proper sense of its importance. For that Lord and Lady Bledisloe will never be forgotten ; it is an everlasting monument to their memory in New Zealand.

Perhaps there is some truth in what his Lordship says about our neglect of the Maori race ; but there are two sides to every question, and there is another side here. No savage race has been better cared for in many respects than the Maoris. I do join most heartily with him in his tribute to the intellect and character of that great Maori orator and statesman, Sir Apirana Ngata. I was for many years a member of the New Zealand Parliament, and this man was there during those years. There were eighty or ninety of us and four Maoris, and he could wipe the floor with any white man in that House as a debater and an orator. His voice, his gestures, his language, were most remarkable, and I venture to say that he would astound this audience if he were here and permitted to talk for five minutes about the Maori race.

I would like to say that the Maori race to-day are the happiest native race in the world. They are first-rate friends with the Europeans. No part of the world do I know of at the moment where there are such happy relations between the natives and the whites as exist in New Zealand. As for their health and education, I had the honour of being the Minister of Health and Education in New Zealand for nearly seven years, and am able to testify that their white brethren in New Zealand are most anxious to see that everything possible should be done for them in these respects.

I want to confess my indebtedness, and I am sure I speak for every New Zealander here, to his Lordship for the time and trouble he must have gone to in preparing such an excellent address. He has again done New Zealand a service in bringing home to the people here what a wonderful race we have in our Maoris.

THE LECTURER replied : I feel bound, after listening to Sir James Parr, to express my deep appreciation of his much too generous tribute to such small services as we were able to render to New Zealand during our sojourn there, but I can say to him with perfect confidence that we have never disguised to the smallest degree that within three months after we returned to the Old Country we longed to be back in the Dominion, and if it were not for numerous and unavoidable commitments in the Old Country we certainly should go back and live there for the rest of our lives. Not only is no more beautiful and varied scenery to be found within so small an area anywhere in the world, but it has the best sport, the most ideal climate, the most fertile land, and, above all, the most lovable people on the face of the globe.

On the motion of Sir Edward Tandy a hearty vote of thanks was accorded to the lecturer for his paper, and to the Chairman for presiding.

*PUBLIC HEALTH AND AGRICULTURE**

BY PROFESSOR HENRY E. ARMSTRONG, F.R.S.

Our change of kings comes at a remarkable moment, at a time which may well be said to be one of critical change in our outlook. I think we may foresee that, when a balanced history is written of the period—less than two centuries—during which we have been subject to the relentless mechanical rule of King

* Reproduced, by courtesy of the Editor of the *Journal of the Farmers' Club*, from the report of a discussion on a paper on the subject by Sir John Orr, D.S.O., M.C., F.R.S.

Coal and agriculture has been thrust aside, when the story is faithfully told of our advance in knowledge within this period, the outstanding event recorded will be the great advance, during the reign of our late Sovereign, in our understanding of the ethics of food.

Suddenly, as if by a miracle—so quickly have we been led to frame our conclusions—we have awakened to a broad understanding and a near approach to a credible philosophy of food. We have learned that life depends upon the concurrent, balanced interactions of a long series of material agents in our food, some of them substances directly derived from the soil, others formed in the plant, all indispensible to health, yet some of them active in most minute proportions. These are all conveniently included under the common term *Advitants* : necessaries of life. The magnitude of the conquest is astounding to those few who can follow it in detail. I happen fully fifty years ago to have given a public lecture in Manchester on Food. When I read what I then said, it is clear that we then knew nothing beyond the little that experience had taught us ; at that time chemistry and physiology were in no way sufficiently developed for us to know.

The effect of the newly-won knowledge upon our national policy must be revolutionary. Farming must inevitably rank as our primary care, as the one industry to be taken under public protection and guidance, if not of control and regulated production. The recognised function of the agriculturist, in the near future, must be to grow complete foods, not mere market-produce as at present. We shall not much longer forgive farmers their ignorance. It is still five years short of a century since Liebig came to England as the prophet of a scientific agriculture and John Bennett Lawes was started into activity, to mislead us unwittingly into over-worship of a few mineral fertilisers. We have much to do if the century is to end with a science as well as an art of agriculture. At present, we have only the tatters ; we have paid far too little regard to life and growth, relatively far too much to commercial considerations. Our soils are exhausted to extents which we have yet to appreciate ; we have to reconstruct them. Our so-called agricultural research has little meaning ; it has no real purpose or policy.

We shall, in future, recognise that the farmer holds a sacred office ; that the health of the nation is in his hands. He must cease from being the well-disposed amateur that he now is ; he will be called upon to take his work as a profession, to be serious and scientific. Please note that there is no mystery about this word : it is derived from *scientia*, knowledge ; *facere*, to make or do ; to be scientific is merely to work with true understanding.

Henry VIII tried to put the Church in order ; Edward VIII may well be called upon to set the house of agriculture in order and so do a greater work for his people than ever king has done before. We can all see that the task will be one of the greatest difficulty ; there are so many conflicting interests. There is not merely a great body of ignorance to be overcome but there is the far greater task of acquiring sound and sufficient knowledge, while setting self aside.

We are called upon to take stock of the situation, to foresee and even to ordain our future.

(1) It will be our duty, in mere self-protection, to produce all the food we can for ourselves. Should we be unable, in the near future, to maintain our prosperity as manufacturers, in face of the competition of the world, we should, indeed, be in Queer Street if we have not developed the use of our land to its full capacity.

(2) Our duty, which it will be inexcusable to evade, will be to produce only best sorts. There is little doubt that, with proper care, we can produce food,

on the average, of far higher nutritive value than that which we can import from abroad, drawn from advitant-starved areas. I may go so far as to say that we now know that, fed with proper food, man, animal and plant will all be in large measure free from disease.

(3) To such ends, we must take the greatest care of education at every grade, in accordance with the maxim laid down in *Kim* by Kipling : " Education greatest blessing when of best sorts, otherwise no earthly use." Present-day education leaves earth out of account. Incidentally let me say that we must free the children, so that once more they may go upon the land and study in out-of-doors schools ; burn the stupid books which keep them from it, to their irreparable loss ; write fit ones for them to read.

(4) We shall be called upon to decide what population our isles can and may carry and even its character ; to deal with the problems of eugenics, so that we may use the food we produce to support a fit people.

(5) To this end, we must consider what land we have, what its value is. This is a matter of stark, staring importance. Professor Stapledon's great book, *The Land*, may be read in this connexion. We have taken no thought for our land ; we have everywhere defiled and destroyed it. Roads have been run in every direction, mainly to serve a new rush whim for speed ; much good land has been sacrificed to their making. Still more, the lands bordering the new roads have been covered with jerry-built houses, largely upon the fertile shelf, not upon the far less valuable slopes. There will soon be no land left in the Thames Valley which can be cultivated. Town planning has made no considered provision even for allotment gardening.

(6) The consequences must be serious. We know that the essence of the value of vegetable food—the element of foremost importance in our food—lies in its freshness. Soon London will produce no such food at its doors ; the possibility of feeding its millions properly will be gone. The destruction of Mr. Secrett's market-garden at Walton-on-Thames, discussed recently at the Royal Society of Arts, is an extreme case of this vandalism, perpetrated, forsooth, by a great public body, the Metropolitan Water Board, a body charged with the care of London's health. Yet no one cares. In no way is our knowledge made to count.

(7) It is certain that proper vegetable food is not to be grown everywhere, that each area has its limited value. We need to study our islands and mark out the areas that may best be used for this or that purpose, and this without any delay.

(8) We are taking no account, in our building operations, of drainage. Vast quantities of invaluable humus matter and of mineral salts, potash and phosphate especially, are being sent to sea, in no sieve ; all goes to the fishes. No economic crop can be grown anywhere unless these are added as fertilisers. The time is at hand when these salts will no longer be available at economic prices. We study Chinese art but not China's sense of thrift in agriculture. Some thought for the morrow in this direction we must soon take. The present aim of civilisation would seem to be only the picture palace.

(9) The problem of problems, the most difficult of all those before us, is to come to an understanding with agricultural industry as to the goods it shall supply. Our first demand must be for milk, properly produced and worthy to be called milk, which most of that made is not. As yet, there is no consensus of opinion as to proper ways of producing it. Summercut dried grass is only now coming to the fore as food. It is worse than farcical that the Milk Marketing Board should be about to spend £60,000 on advertising milk—mostly not milk. Are public

authorities to think only in terms of publicity and the poster ? Good wine needs no bush. No call to drink more would need to be made if the drink were known to be good. Every halfpenny the Board can scrape together should be spent in the study of milk production and of quality. The insanitary byre should forthwith be abolished from the land ; maybe then we should have something fit to advertise. Is there never to be understanding behind the work of these departmental boards ? It is useless for any board or committee to institute observations on children with foods which have no ascertained value ; the blind will but study the halt ; the results will have no scientific value.

(10) Milk is our greatest agricultural problem. I have spoken of the prime importance of vegetable food. There remains bread. We know nothing worth knowing of our cereal foods as foods. We know that in order to save the Americans from doing work and to suit the commercial ends of miller and baker, the masses have been led and condemned to eat a white wheaten flour which has little value except as fuel. Only by eating a *whole-grain meal* shall we be saved. The practical problem at the moment is to make a palatable bread from this. We have also to develop the use of barley, oats and rye as cereal foods. With all respect to Mr. Street, the question of growing cereals, the question to what extent we shall include these in our farming system, is not to be put aside. In so far as we import, we should allow the entry only of whole grain. As to sugar, I will only say that, except as a form of dole, I hold it to be an improper crop to grow.

(11) One last question : on what shall we feed our animals when we ourselves eat the whole grain ? Potato is probably a better food than cereal grain. The relative amounts of the two to be provided will need consideration.

Much more might and should be said, did time permit, in justification of the thesis that the agriculturist, in the future, will be the appointed guardian of public health. Three years ago, at your Annual Dinner, I spoke of agriculture as a great organised national industry, supported by public funds. Surely this must be its happy fate : that we make it our religion, for its aims and ends must be accounted sacred. Our late King, on his return from his world tour, told us to " Wake up." Maybe his son will be the Siegfried to awaken the Brünnehilde of organised intelligence that is dormant in us. His call would be " To Farms ! " and not the dictator's horrible " To Arms ! "

THE EUMORFOPOULOS COLLECTION

The Eumorfopoulos collection, recently acquired by the nation, is on show in the north court of the Victoria and Albert Museum, which is normally to share with the British Museum the honour of housing it.

A visit to this airy court, with the treasures so admirably arranged, is a fine entertainment for the spirit. Chinese art is, somehow, peaceful without being phlegmatic, and exquisite without being finnicky. Solemn rather than exquisite are the great bronze axe-heads dating from time that seems immemorial, and gravely, not unbecomingly pompous, the bulging bronze wine-vessels of the remote Chou dynasty ; after that refinement sets in, but there is no decadence till very late. Britain was still a Roman province at the time of the Six Dynasties, when Chinese artists were producing such superb little naturalistic works of art as the Sleeping Boar, number 270. Ivory glazes came in at this early time, slowly working up to perfection eight or ten hundred years later, in the Sung period, and not wholly declining for an age after that. The little vase with the salamander, number 814,

is a product of the Tehua factory which was at work in the seventeenth and eighteenth centuries ; nothing could be more choice.

The Tang period, which preceded Sung, is wonderfully represented in the Eumorfopoulos collection. In one corner of the court there is what can only be described as a sort of Mappin terrace, on which large gaily coloured camels disport themselves under the supervision of a fiery Tang bandit. For most amateurs who are not themselves collectors Sung suggests, perhaps, ivory glazed vases with incised patterns or no pattern at all. They may now see, besides many such, some splendid lustre bowls of the period, and, if anything still more delightful, the black-and-white painted vases of the Tz'u-chou factory. A stoneware vase painted in brown, from this factory, has wisely been isolated on a pedestal so as to attract the attention it richly deserves.

Sung was also the best period of Chinese painting. 'The so-called Southern school seeks to escape from everyday life into the contemplative beauty of Nature, and the type of severe landscape it produced achieves its end by sublimity of effect and not by romance. The Northern school, on the other hand, is emotional in its outlook . . ." See, for example, Ma Yuan's "Boating by Moonlight." The author of the catalogue rightly points out that the Northern school was nearer European ideals than the Southern—but the boating picture might be taken to exemplify one point of contrast with Western art ; it is uncrowded (to say the least), and empty space is used in a way no Western artist would have risked. A fine delicate yet bold picture of the Ming period is the "Wild Geese Alighting."

Contemporary taste is not as favourably disposed towards the great decorative vases of the K'ang Hsi reign as one may feel it ought to be. The Eumorfopoulos specimens are not as remarkable as the Leonard Gow collection which was to be seen at Burlington House this winter. Still, there are some very fine pieces. No doubt by the beginning of the eighteenth century a modern (not modernist) lust for ostentation was meeting with a too ready response from some artists ; on the other hand, the *famille noire*, even when rather luscious, can be sincere and beautiful. The blue-and-white achieved some new effects, and has won many hearts ever since.

In their preface to the catalogue the Directors of the two museums concerned point out that though the first two instalments of the purchase money for the collection have been paid, "the completion of amount due will seriously cripple the resources of our museums for other purposes during several years to come." For this reason an entrance fee of one shilling is being charged. So it is in two good causes that one may go and pay one's shilling. The Exhibition remains open till towards midsummer.

GENERAL NOTE

PROCEEDINGS OF THE SIXTH INTERNATIONAL CONGRESS FOR SCIENTIFIC MANAGEMENT. LONDON, JULY, 1935.—Surplus volumes containing all the Papers and Proceedings of this important Congress are now available to members of institutions, students, etc., the demands of the members of the Congress having been met. They may be obtained from the Hon. Secretary of the Congress, 21 Tothill Street, London, S.W.1, at the nominal price of 1s. 6d. per volume

(large quantities at 1s. per volume), or 6s. per set, post free. The price of the set to the general public has been £3 3s.

There are seven volumes, six of them covering the subject matter of the individual sections :—Vol. 1, Manufacturing ; Vol 2, Agriculture ; Vol. 3, Distribution ; Vol. 4, Development ; Vol. 5, Educational and Training ; and Vol. 6, Domestic. The seventh is the Report Volume, of which the surplus is small and which will therefore only be obtainable with complete sets.

MEETINGS OF THE SOCIETY

Ordinary Meetings

Wednesday evenings at 8 o'clock (unless otherwise announced).

April 29.—Sir Herbert Matthews, formerly Secretary, Central Chamber of Agriculture, " The Problem of Wheat Supplies in Time of War." The Rt. Hon. Lord Phillimore in the Chair.

May 6.—G. Mackenzie Junner, M.I.A.E., " The Oil Engine and its Influence on Road, Rail and Air Transport." (Illustrated by lantern slides.) Alan E. L. Chorlton, C.B.E., M.P., M.Inst.C.E., M.I.E.E., Past President of the Institution of Mechanical Engineers, in the Chair.

May 13.—Professor R. G. Stapledon, C.B.E., M.A., Director, University College of Wales Welsh Plant Breeding Station, Aberystwyth, " The Case for Land Improvement and Reclamation." The Rt. Hon. Viscount Bledisloe, P.C., G.C.M.G., K.B.E., a Vice-President of the Society, in the Chair.

May 20.—Philip A. de Laszlo, M.V.O., " The Art of Our Day." (Illustrated by lantern slides.) The Right Hon. Viscount Ullswater, P.C., D.L., D.C.L., LL.D., in the Chair.

May 27.—Mrs. Herbert Richardson, F.R.Hist.S., " Early Commercial Advertising in England (from the end of the 15th to the end of the 19th century)." (Illustrated by lantern slides.) Tom Purvis in the Chair.

Indian Section

Friday afternoons at 4.30 o'clock.

Dates to be hereafter announced :—

F. H. Andrews, O.B.E., " The Relations between Chinese and Indian Art."

The Ruler of Aundh, " Indian Art." (Illustrated by lantern slides.)

Dominions and Colonies Section

Tuesday afternoons at 4.30 o'clock.

April 28.—Sir Louis Souchon, C.B.E., Hon. Representative in London of the Mauritius Chamber of Agriculture, " Mauritius."

May 19.—J. W. Munro, M.A., D.Sc., Professor of Entomology in the University of London, " Insect damage to Empire products."

PETER LE NEVE FOSTER LECTURES

REGINALD E. STRADLING, C.B., M.C., D.Sc., Ph.D., M.Inst.C.E. (Director of Road Research, Department of Scientific and Industrial Research), "Problems of Road Research." (Illustrated by lantern slides.) Three lectures, April 20, 27 and May 4.

LECTURE I.—(*a*) FOUNDATION STUDIES—soil mechanics—characterisation of soils—examples of failures in cuttings—settlements and drainage—water content.

(*b*) CONCRETE SLABS—Westergaard's theory—sub-grade reaction—concrete mixes—aggregate grading and bulk supplies—difficulties of control—best mix theories—workability as rational criterion—importance of sand content—water/cement ratio—testing by core cutting.

LECTURE II.—BITUMINOUS ROADS—essential difference between this problem and concrete—deformation—disintegration. Compaction—aggregate shape—crushing during compaction and use—estimates of grading from actual roads—mechanical testing—small scale laboratory work—large scale road machines—correlation. Design of R.R.L. machines.

LECTURE III.—FORCES ON ROAD SURFACES—traffic data—impact forces and their measurement—N.P.L. work—caterpillar. FRICTIONAL RESISTANCE OF ROAD SURFACES—solid and liquid friction—machines used for measurement of slipperiness—"sandpaper" and rougher finishes—results obtained.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, APRIL 27..Engineers' German Circle, at the Institution of Mechanical Engineers, Storey's Gate, S.W. 6 p.m. E. Kurzel Runtscheiner, "**The Vienna Science Museum.**"

Mechanical Engineers, Institution of Storey's Gate, S.W 6.45 p.m. A. C. Murdoch, "**Automatic Refrigeration.**"

TUESDAY APRIL 28..Civil Engineers, Institution of, Great George Street, S.W. 6 p.m. E. J. Buckton and H. J. Fereday, "**Demolition of Waterloo Bridge.**"

Diesel Engine Users' Association, at Caxton Hall, S.W. 5 p.m. Discussion on "**The Horizontal versus the Vertical Oil Engine.**"

WEDNESDAY, APRIL 29..British Academy, Burlington Gardens, W. 5 p.m. Prof. O. Elton, "**Style in Shakespeare.**"

Central Asian Society, Royal, at the Royal Society, Burlington House, W. 8.45 p.m. O. Lattimore, "**The Eclipse of Inner Mongolian Nationalism.**"

Mechanical Engineers, Institution of, at the Grand Hotel, **Sheffield.** 7.30 p.m. J. S. Merry, "**The Corrosion of Boiler Metals.**"

Psychological Society, British, at 55 Russell Square, W.C. 6 p.m. Miss J. A. Wales, "**The Work of a Secretary to a Juvenile Advisory Committee of the Ministry of Labour.**"

THURSDAY, APRIL 30..Imperial Institute, South Kensington, S.W. 2.30 p.m. G. J. J. Smit, "**South Africa—the Afrikaans People.**"

Palestine Exploration Fund, 2 Hinde Street, W. 5 p.m. J. W. Crowfort, "**The Hebrew Monarchy and Archæological Discoveries.**"

FRIDAY, MAY 1. Electrical Engineers, Institution of, Savoy Place, W.C. 7 p.m. C. C. Paterson, "**Uniformity as the Gauge of Quality.**"

Royal Institution, 21 Albemarle Street, W. 9 p.m. Major W. S. Tucker, "**Direction Finding by Sound.**"

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

MEETINGS OF THE SOCIETY

NEXT WEEK

MONDAY, MAY 4TH, at 8 p.m. (Peter Le Neve Foster Lecture). REGINALD E. STRADLING, C.B., M.C., D.Sc., Ph.D., M.Inst.C.E., Director of Building and Road Research, Department of Scientific and Industrial Research, "Problems of Road Research." (Lecture III.) (Illustrated by lantern slides.)

WEDNESDAY, MAY 6TH, at 8 p.m. (Ordinary Meeting). G. MACKENZIE JUNNER, M.I.A.E., Editor of *The Commercial Motor*, "The Oil Engine and its Influence on Road, Rail and Air Transport." (Illustrated by lantern slides.) ALAN E. L. CHORLTON, C.B.E., M.P., M.Inst.C.E., M.I.E.E., Past President of the Institution of Mechanical Engineers, will preside.

COUNCIL

A meeting of the Council was held on April 20th. Present:—Colonel Sir Henry McMahon, G.C.M.G., G.C.V.O., in the Chair; Mr. Fred H. Andrews, O.B.E.; Sir Charles H. Armstrong; Dr. Edward F. Armstrong, Ph.D., D.Sc., F.R.S.; Lord Askwith, K.C.B., K.C., D.C.L.; Sir Felix Brunner, Bart.; Sir William Henry Davison, K.B.E., D.L., M.P.; Mr. Peter Macintyre Evans, C.B.E., LL.D.; Sir Edward A. Gait, K.C.S.I., C.I.E.; Sir Reginald Glancy, K.C.S.I., K.C.I.E.; Mr. Ernest W. Goodale, M.C.; Sir Robert A. Hadfield, Bart., D.Sc., F.R.S.; Sir Thomas Henderson; Mr. Charles Geoffrey Holme, M.B.E.; Major Sir Humphrey Leggett, R.E., D.S.O.; Mr. G. K. Menzies, C.B.E.; Mr. Oswald P. Milne, F.R.I.B.A.; Mr. Tom Purvis; Mr. Harold W. Sanderson; Brigadier Sir Edward A. Tandy, and Mr. Carmichael Thomas, with Mr. W. Perry (Secretary) and Mr. K. W. Luckhurst (Assistant Secretary).

The following candidates were duly elected Fellows of the Society :—

Alexander, Samuel, Johannesburg, South Africa.
Amery, Frederick James, Shortlands, Kent.
Argetoianu, Emmanuel Constantino, Bucharest, Roumania.
Ascoli, Frank David, C.I.E., M.A., London.
Ashthana, Rajendra Prasada, M.Sc., Ujjain, India.
Banerji, Ajit Kumar, Gopalpur, Bengal, India.
Batty, Frank, Wembley, Middx.
Bisschop, Adolf Frederik, Cape Town, South Africa.
Booth, Sir Alfred, Bart., London.
Bottomley, John Hubert, Hong Kong, China.
Bull, Herbant Singh, Kuala Lumpur, Federated Malay States.
Burr, Alfred, London.
Chettle, James P., Stockport, Cheshire.
Chorlton, Alan E. L., C.B.E., M.P., London.
Clark, Claude C., Southsea, Hants.
Clay, Mrs. Phyllis M. C., Bletchingley, Surrey.
Clayton, Albert Edward, Sheffield.
Currie, Sir William Crawford, Aylesbury, Bucks.
Curtis, Wilfrid Henry, London.
Dashti, Mirza Abdullah Khan, B.A., B.Sc., Masjed-i-Suleiman, Iran.
Davies, George William, Dunedin, New Zealand.
Davison, F. C., Tynemouth, Northumberland.
De Lardi, Alfred A., Drexel Hill, Pa., U.S.A.
Edmunds, John T., Johannesburg, South Africa.
Field, James Hermann, C.S.I., M.A., Reigate, Surrey.
Garrard, Montague, London.
Gerrard, Harry, Leigh, Lancs.
Gibb, Stanley Watson, London.
Gillespie, Colin Arthur, Moulmein, Burma.
Ginsburg, Naum, London.
Golding, L. G., Adelaide, South Australia.
Gray, Ronald, M.C., Auckland, New Zealand.
Halahan, George Edward Desmond, London.
Hammond, John, M.A., D.Sc., F.R.S., Cambridge.
Harrison, Frederick William, Thames Ditton, Surrey.
Hobday, Stephen Reginald, London.
Hopper, Richard John, London.
Lamb, Cyril Leonard, Brakpan, Transvaal, South Africa.
MacGillivray, Lester, M.C., J.P., Apiqua Falls, British Guiana.
McLintock, Sir William, Bart., G.B.E., C.V.O., London.
Mahmudabad, The Raja of, Mahmudabad, India.
Main, Sidney Arthur, B.Sc., Sheffield.
Matthews, Trevor J., Jersey, Channel Islands.
Mayurbhanj, The Maharaja of, K.C.I.E., Mayurbhanj, India.
Mody, Khan Bahadur Sorab Rustomji, Bombay, India.
Money, C., Derby.
Moore, Peter C., London.
Osborn, Harry, Chichester, Sussex.

Paget, Frederick Charles, London.
Pelikan, Alfred George, M.A., Milwaukee, Wis., U.S.A.
Potter, Walter Collier, London.
Radcliffe, Miss Sarah Ethel, London.
Raghava-Rao, Bhartipudy Srinivasa Vira, B.A., M.Sc., Ph.D., Waltair, India.
Rao, Bijoor Sanjiva, B.A., M.Sc., Bangalore, India.
Richardson, Mrs. Herbert, London.
Sampson, Hugh Charles, C.I.E., B.Sc., St. Leonards, Tring, Herts.
Schat, Ane Pieter, Utrecht, Holland.
Senior, E. P., B.Sc., Buenos Aires, Argentine.
Settle, Mrs. Alison, London.
Sheffer, Alfred T. S., Howrah, Bengal, India.
Sherwell, Thomas Yeo, West Didsbury, Manchester.
Shillidy, John Armstrong, C.S.I., Sidcup, Kent.
Stevens, Granville Walter Guy, Barnstaple, Devon.
Stevens, Percival, Sangre Grande, Trinidad, B.W. Indies.
Syed, Nawab Sirdar Ali Khan, Sirdar Nawaz Jung Bahadur, Hyderabad, Deccan, India.
Taylor, Mrs. D. D. Cottington, Carshalton, Surrey.
Torrey, Major Gerald Franklin, M.C., London.
van Donkelaar, Arie, Amsterdam, Holland.
Vivatana, Luang Yuktasevi, M.Eng., Bangkok, Siam.
Waldram, John Malyon, B.Sc., Pinner, Middx.
Walford, Leslie Charles Alfred, Montreal, Canada.
Watlington, E. Hugh, Hamilton, Bermuda.
Wentworth-Shields, Pat, London.
Whitfield, F. G. Sarel, Khartoum, Sudan.
Williamson-Noble, Hon. Mrs. Sheila Black, London.

A letter from the Home Secretary was read conveying the thanks of His Majesty the King and Her Majesty Queen Mary for the Addresses which were presented to them by the Society on the occasion of the death of His Late Majesty King George V. (These Addresses were reproduced in the *Journal* dated March 20th.)

Further consideration was given to the question of the award of the Albert Medal for 1936.

Preparation of the Balloting List for the next Council was begun by declaring vacancies.

Mr. J. A. Milne, C.B.E., was appointed a Trustee under the Art Congress Studentship Trust.

Mr. F. H. Andrews, O.B.E., was appointed as the Society's representative on the Governing Body of the Register of Designers of the Board of Trade Council for Art and Industry.

A copy of the conditions of the offer of Rayne Gold Medals for shoe design, which had been circulated to the technical colleges concerned, was laid on the table.

A quantity of financial and formal business was also transacted.

PROCEEDINGS OF THE SOCIETY

FOURTEENTH ORDINARY MEETING

WEDNESDAY, MARCH 4TH, 1936.

LIEUTENANT-COLONEL SIR WILLIAM A. WAYLAND, M.P., in the Chair.

THE CHAIRMAN, in opening the meeting, said :—I have pleasure in introducing to you my old friend Mr. Blake, one of our leading radiologists. What you are going to hear to-night I am confident will be of the greatest interest to you. I presume I may say with truth that during the last few years there has been a wonderful development of wireless or electrical energy. This is, I believe, the first lecture given in London dealing with the physics of heterodyne music. There have been a number of musical recitals by Theremin, André Ledor and one or two others, but I understand that this is the first time that the apparatus itself has been lectured upon in detail. I have been very much interested to hear how such apparently widely disconnected subjects as radiometric condensers, heterodyne music and the treatment of deafness are in reality intimately related. One scientific discovery frequently leads to another in quite a different field of research.

I understand we are to have a musical treat at the end of this lecture. Mr. André Ledor has very kindly promised to give a short recital of heterodyne music on his Electronde. Mr. Ledor is one of the three or four leading players of this instrument. He is a Gold Medallist of the Amsterdam Conservatoire, and has performed in America and several European capitals. I want to thank him very much indeed, even at the beginning, on your behalf for so kindly responding to our request to play to us.

The following paper was then read :—

ELECTRICALLY PRODUCED MUSIC

(Heterodyne Method)

By G. G. BLAKE, M.I.E.E., F.Inst.P.

INTRODUCTION

There are already a large number of electrical musical instruments, such as Nernst's electric piano, made by Siemens & Halske in co-operation with the Bechstein piano works ; Givelet's Radio Piano ; the Vierling Piano as developed by the Hertz Institute in Berlin ; the Hellertion, by Hellberger of Frankfort ; Toulon's Cellulophone; the Winch Photo-electric Organ, invented by G. J. Winch and developed by the Manchester College of Technology ; L. E. A. Bourn's Electrostatic Organ, the " Electrone," under development by The Compton Organ Company ; the Magneton, and many others, including mechanically-played violins, electric piano-players, etc. I have decided this evening to confine this lecture to one special type of electrical production of music, *viz.*, the heterodyne method.

Great possibilities lie open in this new field of research. Pure musical tones can

be produced, and by means of suitable filter circuits unwanted harmonics can be eliminated and overtones introduced so that it is possible to copy the characteristics of almost any form of musical instrument, from wind to string. Already a considerable amount of laboratory work has been done, but up to the present comparatively little has been published.

Historical

The method of musical production which we are demonstrating this evening was introduced into this country by Leon Ssergejewitsch Theremin in 1927, when he delighted a large audience (of which I was an appreciative member) with a recital of "Music from the Air," at the Royal Albert Hall on December 27th of that year. From some notes on electrical musical instruments which appeared in the *Electrical Review* in 1934 it would appear that Dr. Trautwein of the Berlin High School of Music claims a precedence of six months in the invention of electrical music, when the latter invented an instrument called the "Trautonium."*

After Theremin's recital, little more was heard of "Music from the Air" in this country until Taubmann gave a recital on his "Electronde" before the Golders Green and Hendon Radio and Scientific Society in the winter of 1933. The instrument he used was very similar to Theremin's Etherophone and was a production of the Electronic Music Development Company.† Since that date, this type of electrically produced music has been played in this country at various music halls and at some of the large stores. I listened to one such recital at Kingston-on-Thames a couple of years ago.

Before leaving the historical side of this method of music production, I should mention a French instrument called the "Martinot." I was present at a recital on this instrument in a London store in March, 1934, and although the player sat before it and played on keys (as when playing a piano) the basic principle, so far as I could judge, was the same.

Having listened to these various recitals, I became interested and decided to construct an instrument for my own use at home. But after a careful search in various libraries I soon discovered that literature on the subject was very scarce. At the end of this paper a list of references will be found which may be useful to anyone else who may develop an interest in this new and fascinating way of producing music.

There is nothing particularly new about this method merely as a method of sound production—the originality consists in the employment of the well-known heterodyne beat method for the production of "music for music's sake." I have not seen the inside detailed working arrangements of any of the above-mentioned instruments, but, so far as I can judge, they all operate on much the same scheme

*An article describing the principle on which this instrument operates is noted in Ref. 5.

† Briefly described in *The Electrician* in 1934. (Ref. 3.)

as my own, which we have christened the "Ethonium." After it has been described to you, you will be able to appreciate the comparatively small differences between these various instruments.

In my last lecture before the Royal Society of Arts in 1933, I employed Whiddington's heterodyne beat method in order to measure the infinitesimally small capacity changes due to the movements of the aluminium leaf of my radiometric condenser. It is strange indeed how one scientific study leads directly to another with which the first has no immediately apparent connection.

Reference to Fig. I in my previous lecture (see *Journal*, Vol. lxxxii, p. 157) will show that on that occasion two small transmitters C and D were tuned to exactly the same radio-frequency. The frequency of D was adjusted by means of a handle W which varied the capacity of a small condenser C^3. Under normal conditions the frequency of the other transmitter C was fixed. The radiations from these two transmitters were picked up by means of an ordinary portable wireless set P attuned to exactly the same frequency.

When all adjustments were correct, the frequency of both the transmitters being the same and at a rate of vibration above audition, no sound was emitted from the loudspeaker belonging to the portable wireless set. But when heat radiations were directed on to the leaf of the radiometric condenser C^1, the latter moved ever so slightly away from its back plate and the capacity of the condenser was thereby reduced; consequently the frequency of transmitter C gradually increased and became more and more out of phase with the oscillations of the other transmitter D. As a result of a deep bass heterodyne note was emitted from the loudspeaker and gradually rose in pitch as the capacity changed. When the source of the heat radiations was removed from the vicinity of the radiometric condenser, the leaf of the latter slowly returned to its original position, the musical scale from the wireless set descended until the two sets once more went into phase, and silence reigned again.

The point which I wish to make by this somewhat detailed *resumé* is that, given two suitable transmitters (oscillators) and a wireless receiver all in exact tune, the very slightest capacity change which may take place in either of the transmitters will be the cause of heterodyne beat notes from the wireless set. This is the underlying principle upon which all the above-mentioned musical instruments are operated, including my own Ethonium.

Experiment 1.—Beat notes produced by sound waves in air.—In order to illustrate the production of beat notes the lecturer simultaneously sounded two musical instruments. To commence with, he played the same note on both, and explained that as they were vibrating at the same frequency, *i.e.*, as they were in phase, they were emitting identically the same note. He then very gradually altered the rate of vibration of one of the instruments and showed that, in addition to the production of a second note corresponding to the altered rate of vibration, a third or heterodyne beat note could be distinctly heard. Attention was called to the fact that this beat note made

its appearance as quite widely separated beats of sound which came closer and closer together as the two instruments went more and more out of tune. In this experiment the beat notes were being produced in air by the heterodyning of sound waves. The principle employed in the electrical production of music is the electrical counterpart of this experiment, but in that case the rate of vibration of both oscillators is so rapid that it does not produce an audible note so long as they are both vibrating in phase. But whether the two notes are heterodyning at audio- or at radio-frequencies, the production of a beat note will take place just the same, and its pitch will depend upon the difference between the frequencies of the two primary notes.

Experiment 2.—The electrical production of beat notes.—The lecturer connected up his Ethonium, which, he explained, consisted of two electrical oscillators (or transmitters) suitably coupled to a wireless set, and showed the following effects :—

(1) When the two oscillators and the wireless set were all in perfect tune, silence reigned.

(2) If one of the oscillators was slightly detuned, beat notes were at once emitted from the loudspeaker of the wireless set.

(3) The movement of the lecturer's hand towards or away from the aerial attached to one of the oscillators varied the frequency of that oscillator and produced musical notes from deep bass right through the musical scale to the shrillest treble.

This alteration of tuning was due, he explained, to extremely small changes of capacity, so small that the slightest movement of his hand at a distance of more than a yard from the instrument altered the pitch of the note. It was pointed out that although in the case of the Ethonium the pitch increased with increase of capacity, and in the case of the radiometric condenser (previously described) a reversed action was observed, no real difference in principle was involved—the direction of the change of pitch was only a question of adjustment.

(4) The circuits of the Ethonium were then readjusted and the existence of a zero zone was demonstrated at a distance of about 2 feet from the aerial. As long as the demonstrator kept his hand within this zone, silence was maintained ; but if he moved it either nearer to or further from the aerial, musical production commenced with deep bass notes on either side of zero. The further the hand was moved away from zero in either direction the higher became the pitch.

The lecturer explained that when he moved his hand further from the aerial he was decreasing the capacity. This was the exact action made use of in the heterodyne circuits he had employed in connection with his radiometric condenser in 1933.

(5) By further adjustment he demonstrated that the zero zone could be shifted in space, *i.e.*, brought nearer to or moved further from the aerial. This control of the zero zone was very important, as it gave the player of the Ethonium the ability to extend or to contract the length of the musical scale over which he intended to play. It was like having a piano with an elastic keyboard capable of extension for a man with long arms, or of contraction to suit a man with a short reach.

In the absence of needful constructional details I met with considerable difficulty

in constructing two suitable oscillators. They had to be of extremely low power, so as not to set up local radio interference,* and they had to be capable of maintaining their respective frequencies independently of one another. It took a considerable amount of experimenting before I was able to arrange a suitable coupling which, while sufficiently tight to convey high-frequency oscillations from both oscillators to the wireless set, was also sufficiently free to allow both oscillators to operate independently. Unless great care was taken, the more powerful of the two would gradually pull its fellow into step and in the process of so doing the effective field surrounding the aerial would gradually close up. This was most distressing to the musician. It was something like chasing a piano around the room while you played it until, finally, it went out of the door and left you behind to apologise to the audience.†

The following two alternative methods of construction lay before me :—(1) To pick up energy from two oscillators at radio-frequency and employ the detector and amplifier of a ready-made wireless set, or (2) to arrange a grid leak and condenser in one of the oscillators (or a potentiometer, or even a crystal) as a rectifying detector, and to feed the audio-frequencies into a suitable amplifier on their way to a loudspeaker.

I have tried out both these schemes, and will show you the results obtained.

Radio-Frequency Method

Fig. 1 is a diagram of the actual circuits employed. To the radio expert these will need very little explanation. The valves employed are a couple of P.M.6's. It will be observed that one oscillator A is competely screened in a metal box. Both oscillators A and B are tuned to a wavelength of 239 metres.‡ Preliminary adjustment is made on condenser C belonging to oscillator B, and fine adjustment to regulate and fix the range of the field surrounding the aerial L is finally made by means of C^1 (this may take the form of a small variable condenser, or it may be a small earthed sheet of metal), the position of which (in relation to the base of the aerial) can be adjusted by means of a long handle.

Normally the press button switch S closes contact. When it is depressed the contact is broken and oscillator B ceases to function. This switch is held in the hand of the musician and is only depressed when " rests " in the music are required. (*Musical rests*, *Method* 1.)

P is an insulated wire which passes right through the inside of the metal box containing oscillator A and a short distance into the field of oscillator B. This acts as a " pick-up " and conveys energy to the detector of the distant wireless

* The oscillators used this evening employ a common 6-volt battery to heat their filaments and to supply an E.M.F. of 6 volts to their plates. The current in each of their plate circuits is 1-10th milliampère.

† Frequency drift is dealt with on page 236 of Dr. Dye's work on a Standard Harmonic Wavemeter. (Ref. 19.)

‡ The other radio-frequency Ethonium we are using this evening is tuned to 452 metres.

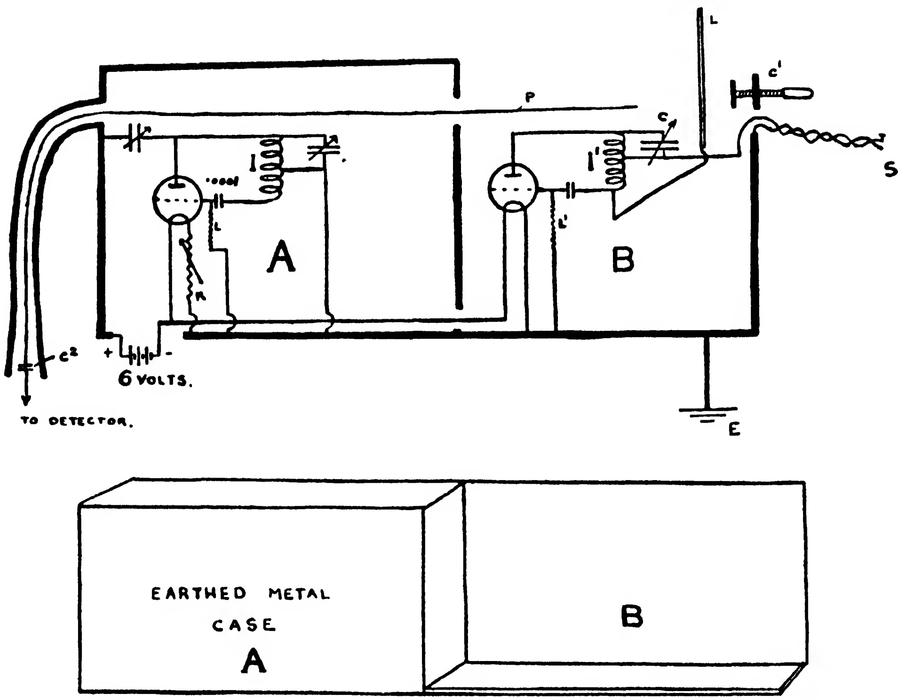
L
C'
P
C
S
l
l'
·0001
L
L'
A
B
R
C²
+ -
6 VOLTS.
TO DETECTOR.
E
EARTHED METAL
CASE
A
B

FIG. 1.

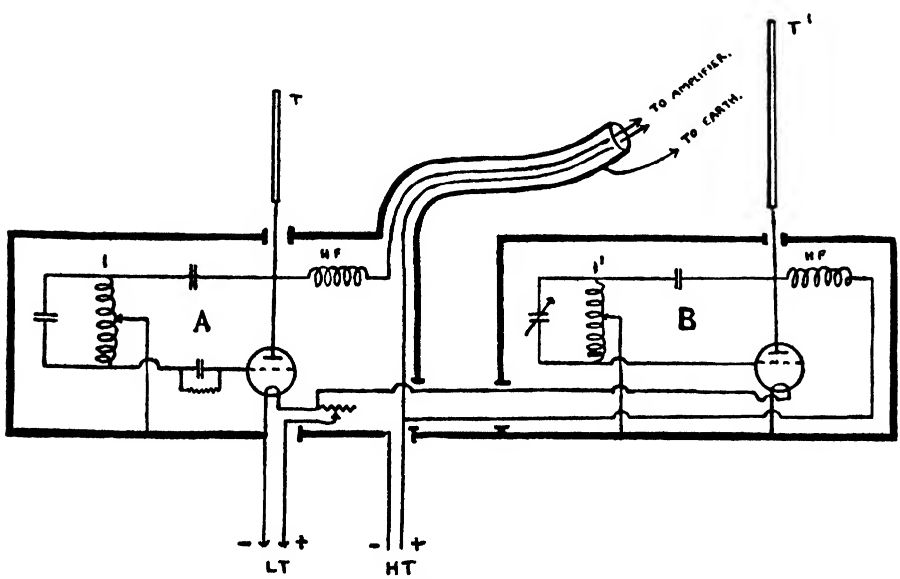
T
T'
TO AMPLIFIER.
TO EARTH.
HF
HF
l
l'
A
B
- +
LT
- +
HT

FIG. 2.

set. Note that after it leaves the metal box it is surrounded by an earthed screen, which is connected to the chassis of the wireless set.

Audio-Frequency Method

This is seen in Fig. 2. A functions both as an oscillator and detector. The audio-frequency impulses are conveyed to the grid of the first valve of an amplifier as indicated, through an earthed screening tube. T and T¹ are short aerials which can be connected as shown, or directly, to inductances I and I¹. The musician plays in the field of aerial T¹, whilst T acts as a pick-up to convey energy from oscillator B in through the earthed box to A.

Aerial T is set at right angles to T¹, and its dimensions are critical, so critical, in fact, that if the left hand of the musician is rapidly brought close to it, its oscillator will be put out of action and will remain quiescent until his hand is withdrawn. (*Musical rests, Method* 2.)

> *Experiment* 3.—The lecturer then connected up the low-frequency Ethonium to an amplifier, and after playing a few notes of a tune he demonstrated the extremely critical dimensions required for aerial T¹. As soon as he placed a small piece of metal foil (smaller than half a postage stamp) over the end of it, and even after carefully retuning the circuits, the quality of the music was altered, and when he continued playing, the music sounded as though a blanket had been placed over the loudspeaker.

Regulation of the Musical Volume

There are several ways in which it is possible to vary the volume of the sound from the loudspeaker. Whichever method is adopted, it is essential that the notes shall remain constant in pitch, when the volume is increased or decreased. Theremin in his instrument makes use of the principle employed in an absorption wavemeter.

His scheme is most original. He employs an independent oscillator inductively coupled to a closed tuned circuit which includes an induction coupling to the filament of the last valve of his amplifier. Sufficient radio-frequency current is picked up in this circuit to make the filament glow to its maximum brightness. The closed tuned circuit is also inductively coupled to a second tuned circuit (not quite in tune therewith), and attached to the latter is a small loop aerial.

When one hand of the musician approaches or retires from the loop, more or less energy is absorbed from the filament supply. As the filament brightness varies, the current passed through the loudspeaker is also, of course, regulated, and the music is made softer or louder. When the hand of the player is brought sufficiently close to the volume control loop, silence results, and in this way "musical rests" are obtained. (*Musical rests, Method* 3.)

Another very simple manner in which the musican can control the volume of his music is by the attachment of a foot lever to the volume control of the wireless set. In my earliest experiments I adopted this scheme, but it proved awkward to operate. Another scheme is to employ a foot-operated rheostat, connected in

parallel with the loudspeaker. When the foot rests lightly on the pedal the resistance of the circuit is negligible, the loudspeaker is practically short-circuited, and the notes therefrom are hardly audible. As the pressure of the foot is increased, a corresponding increase of resistance takes place and the notes gradually swell in volume. This is the method employed to control the volume of the "Electronde." At first I employed this method with my "Ethonium," but it had one serious drawback. When Ethonium music and the gramophone were played simultaneously, the foot-control altered the volume of both of them at once. Obviously they required independent control.

Method for Independent Control of Ethonium Music

The following is another method of volume control which I have designed to provide separate control for the Ethonium without affecting the volume of the gramophone music, when it is being produced from the same loudspeaker (needful variations of intensity of the latter are made in the usual way by means of a separate volume control on the gramophone). With the permission of Messrs. McMichael I have made the needful alteration to the wiring of the set which they have kindly lent for our use this evening, and my wife will shortly demonstrate this method of volume control.

The radio music which is picked up from the Ethonium is (in part) deflected to the frame of the wireless set before its residue is fed into the first stage of audio-frequency amplification. This is achieved by the introduction of a variable resistance* between the output of the last radio-frequency valve and the chassis, of course, without disconnecting the existing connections to the audio-frequency amplifier.

When the resistance inserted is extremely high, the volume of the music is not appreciably reduced, but as the resistance is decreased, the leakage to the chassis increases and at last, when all the resistance is cut out, all the current is deflected to the frame and silence results.

This is by far the best method of volume control with which I have experimented, as much better gradation of control is obtainable before, than after, amplification. I have found it most convenient for the musician if the resistance is made up into the form of a hand-operated volume control. As you will see later, the player uses it both for control of volume and also to cut off the music completely for the provision of "musical rests." (*Musical rests*, *Method* 4.)

Superimposition of Ethonium Music upon Radio and Radio-Gramophonic Music

When employing an Ethonium operating on the audio-frequency method,

* I have experimented with condensers in the place of resistances, to by-pass the R.F. to the frame. A 1-microfarad condenser will by-pass everything, and can be employed for musical "rests." Smaller capacities reduce the volume, but it is difficult to design a variable condenser of from zero to 1 Mfd. maximum capacity.

connected to the amplifier of an ordinary wireless set, it is possible to use the set in the ordinary way connected to a short aerial to pick up any music which happens to be available in the ether (on any wavelength), and using this music as an accompaniment to play on the Ethonium. Both the radio music and that of the Ethonium can be produced simultaneously from the same loudspeaker.

> *Experiment* 4.—Some music was then picked up from one of the broadcasting stations, and the lecturer superimposed a few notes by way of illustration.

By connecting the electro-magnetic pick-up from a gramophone to the grid circuit of the first amplifying valve of the wireless set, and at the same time leaving the amplifier also connected to the detector circuits, a musician can play any music he desires on the Ethonium, to a suitable radio-gramophone accompaniment, both his music and that from the gramophone being produced simultaneously from the loudspeaker of the wireless set.

> *Experiment* 5.—A short demonstration was then given by Mrs. G. G. Blake (wife of the lecturer).
>
> She played first to an ordinary gramophone accompaniment, *i.e.*, the Ethonium music coming from the wireless set, and the gramophone music by mechanical pick-up from its own horn; then to radiogram accompaniment (in this case the music which she played was introduced into the same loudspeaker, and both Ethonium and gramophone music were produced simultaneously), and finally to piano accompaniment (by Mrs. H. Ashley Scarlett), this last item being performed on the lecturer's latest type of Ethonium.

Triple Heterodyne

I now come to the production of a heterodyne note from the loudspeaker of a wireless set, between the audio-frequency notes of an audio-frequency Ethonium and those from a radio-frequency Ethonium (both operating simultaneously on the same wireless set). Fig. 3 is a diagram illustrating the triple heterodyne principle involved in this experiment. A and B represent two oscillators in an audio-frequency Ethonium, both oscillating at a frequency too high to be audible, but having a slight difference in frequency which produces an audible beat note represented by circle C.

D and E represent the two oscillators of a radio-frequency Ethonium, also operating at a frequency above audition, but having a slight difference in their frequencies producing an audible note represented by circle C^1. The audio-frequency and the radio-frequency Ethoniums are connected respectively to the amplifier and to the detector of the same wireless set W, and the resultant notes C and C^1 are produced simultaneously from its loudspeaker.

When these notes are in exact tune only ONE note is heard, but the very slightest difference in tuning results in the production of a beat note between notes C and C^1 as indicated in the diagram at C^2. With this arrangement we have actually three separate heterodyne effects all operating simultaneously in one instrument, and

I foresee possible applications of this principle to physics where extremely fine measurements of capacity, inductance, or frequency, are required.

Experiment 6.—The lecturer then connected the two types of Ethonium (audio- and radio-frequency) to the wireless set and demonstrated the production of beat notes and the playing and reproduction of music from both instruments simultaneously.

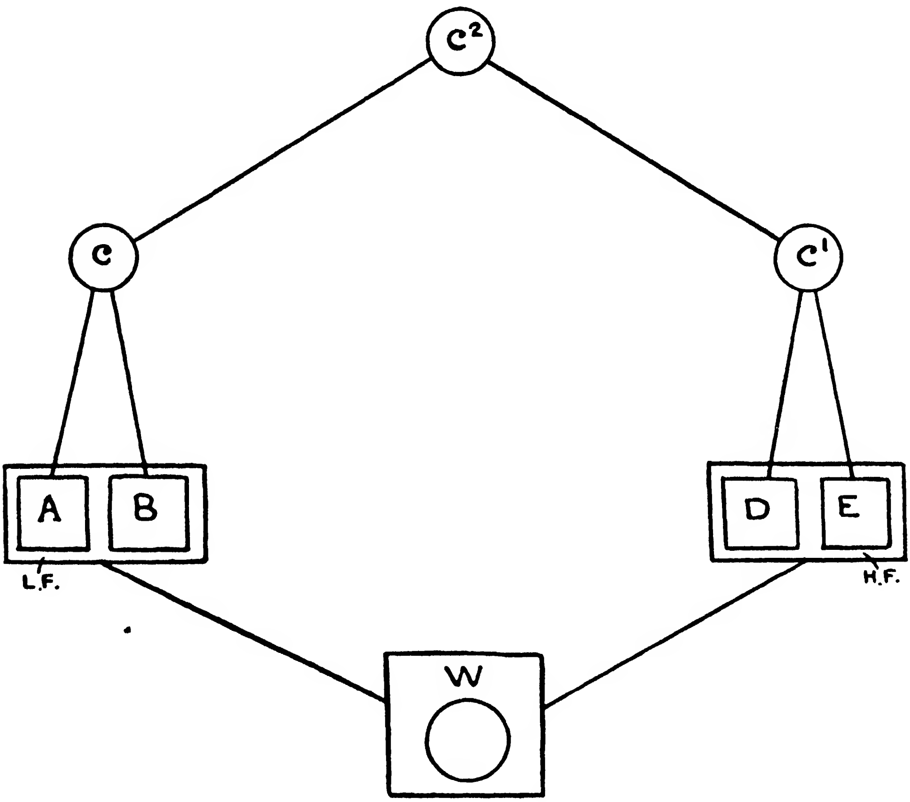

Fig. 3.

CONTROL OF THE TIMBRE OF ETHONIUM MUSIC

Theremin and others by means of suitable filter circuits have already been able to suppress unwanted harmonics and to introduce needful overtones, thereby altering the quality of this electrically produced music, so that it gives a very faithful imitation of a flute, a violin, a cornet, a banjo, or other musical instrument.*

I have not yet had time to do much experimenting in this direction. Fig. 4 is a simple arrangement by means of which, as we shall show you, a somewhat crude

* Much useful information on harmonics can be obtained by reference to Dr. Dye's work at the N.P.L. (Ref. 19.)

representation of a violin, a mandolin and a flute can be produced. By making a real study of the matter and analysing the wave form of the music from the instrument it is desired to copy, it would be possible by means of a cathode ray oscilloscope to build up the musical timbre of the electrical music to a fairly faithful agreement with that from the original instrument. The figure needs little explanation. When switch S is closed, the ordinary flute-like music from the Ethonium is produced. When only a relatively small resistance R is inserted in the position shown in Fig. 4, the music sounds like a violin. By the addition of still more resistance R^1, the voltage across the combined resistances R^1, R, suffices to charge up condenser C^1 at a comparatively slow rate through the iron-cored choke I. The voltage across this condenser slowly rises until it attains the critical

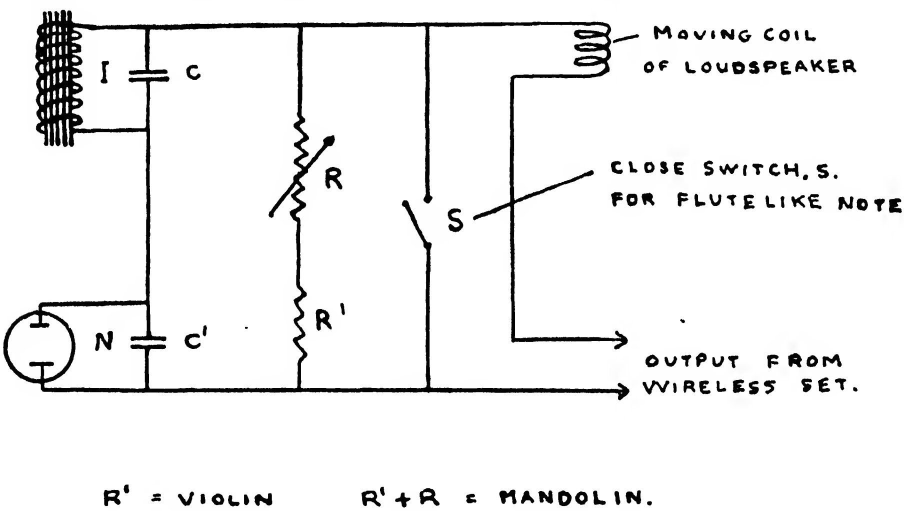

FIG. 4.

voltage of a neon tube, N, when it is instantaneously discharged. This cycle of events is repeated, the sound of the music from the Ethonium then becoming like that from a mandolin.

Experiment 7.—A demonstration was then given of flute, violin and mandolin music.

The production of musical notes by heterodyne is independent of the fundamental frequency of the oscillators employed. That is to say, provided its two oscillators are exactly in phase to commence with, they can be operated at any desired frequency. One of our Ethoniums this evening is operating at 1,250,000 cycles. When one of its oscillators is detuned so that it is only oscillating at 1,249,900 instead of its original 1,250,000 cycles, the difference of frequency between the oscillators will be 100 cycles, which is well within the audible range of frequencies.

Another of our Ethoniums this evening is operating at a frequency of 670,000 cycles; if we detune one of its oscillators to a frequency of 669,900 the difference

between them will be again 100 cycles, and our second Ethonium will emit exactly the same musical note as the first.

We can pick up and produce the music from the 1,250 kc. Ethonium on one wireless set tuned to that frequency, and simultaneously pick up and produce the music from the other Ethonium on a second wireless set tuned to 670 kc. without any wireless interference taking place between them. This, as you will see, opens up the possibility of electrically-produced orchestral music from a number of Ethoniums or similar instruments played simultaneously. To illustrate this a duet will be played on two Ethoniums during the recital after this lecture.

An Investigation of the Field Surrounding the Aerial of an Ethonium

The polar diagrams shown in Fig. 5 were made in order to study the shape of the

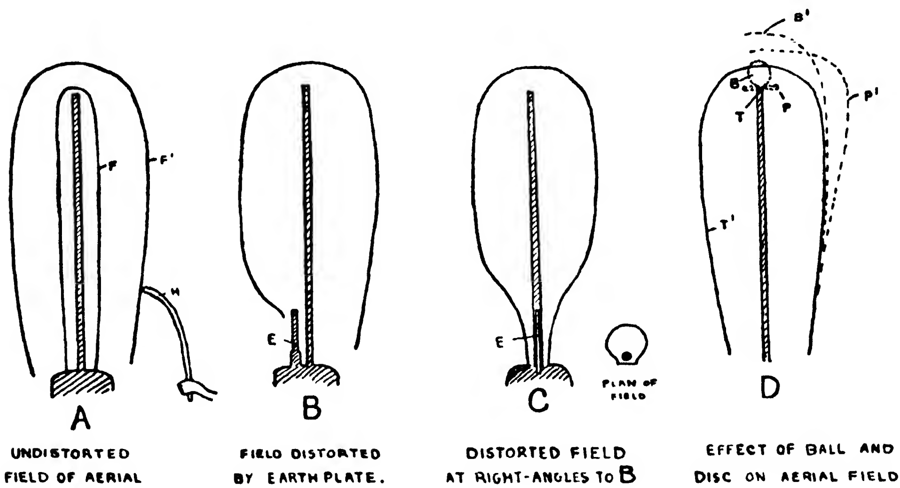

Fig. 5.

field, and the effect of altering the position of the small earthed metal plate E in relation thereto. This metal plate is used in practice in place of the variable condenser C^1 in Fig. 1, in order to give vernier adjustment when tuning, and to adjust the distance to which the field of the aerial shall extend. The following was the method adopted for drawing these polar diagrams.

A Pointolite lamp was employed as illuminant and so arranged with respect to the aerial of the Ethonium that it cast a shadow of the latter upon a large sheet of white paper. A long crook of metal wire (the shadow of which was also cast upon the paper) was then approached towards the aerial until it entered into the edge of the electric field. As soon as this occurred, a deep bass heterodyne beat was produced in the loudspeaker, and whilst the metal crook was held stationary the position of its shadow was marked on the paper. In this way the field was carefully outlined.

The metal crook H in Fig. 5 A which is just entering the edge of the electric field has been added to this diagram in order to assist the reader to visualise the manner in which these graphs were drawn. F illustrates the shape and extent of the field according to one setting of condenser C^1 in Fig. 1. A readjustment extended the edge of the field to a position F^1, and by further adjustment the field could be extended to a distance of several yards from the aerial. No matter to what distance this extension of field is set, the whole audible musical range (from one or two beats per second up to 8192—the highest treble note of a piano—and even on past this until the note is too shrill to be audible) exists between the outer edge of the field and the aerial.

Figs. 5 B and 5 C show the shape of the field and the distortion thereof produced by the insertion of the earthed metal plate E at the base of one side of the aerial. In Fig. 5 D, T^1 indicates the normal shape of the field surrounding aerial rod T. P^1 shows distortion when a small circular flat metal plate P is placed on the top of the aerial T, and B^1 indicates the distortion of the field when this is removed and replaced by a small metal ball B.

> *Experiment* 8.—A polar diagram was then drawn before the audience by shadows cast by a Pointolite lamp in the manner indicated above.

From the polar diagrams you will have seen that the addition of a metal ball or plate affects the field of the aerial. These heterodyned circuits are extremely sensitive to the very smallest changes of capacity. We will illustrate this by a simple experiment.

> *Experiment* 9.—The Ethonium was first tuned to silence, *i.e.*, both its oscillators were in perfect phase. It was then demonstrated that almost any object placed on the top of the aerial would increase its capacity sufficiently to produce a note from the loudspeaker. The audience were able to distinguish the notes respectively produced by a pin, a safety pin, several different coins, a lump of sugar, an onion, etc.

The electrostatic field surrounding the aerial of the Ethonium will penetrate through and extend on the further side of a large sheet of cardboard, a wooden board, or a sheet of plate-glass, etc.

> *Experiment* 10.—The following obstacles were placed between the aerial of the Ethonium and the hand of the player, without preventing him from playing: a sheet of cardboard, a wooden drawing board, a large suitcase, a sheet of plate-glass and a metal tea tray.
>
> With regard to the tea tray it was pointed out that, when the object was metallic, it was essential for it to be insulated from earth.

Pulsophonic Treatment for Deafness

At the commencement of the lecture it was explained how the experiments with radiometric condensers had led directly to this work on the electrical production of music. When, as I do, one experiments as a "free-lance," it is truly surprising how the various lines of work link up.

These electrically-produced music experiments have led me right back to my

own special field of work, "Electro-medicine," and, as you will see, have suggested a new treatment for deafness which I have designated the "Pulsophone." It occurred to me that useful results in the treatment of deafness might accrue if sound waves were applied to the ear-drum simultaneously with the application of electrical stimuli to the auditory nerves.

The procedure is as follows :—Electrical impulses are applied to the auditory

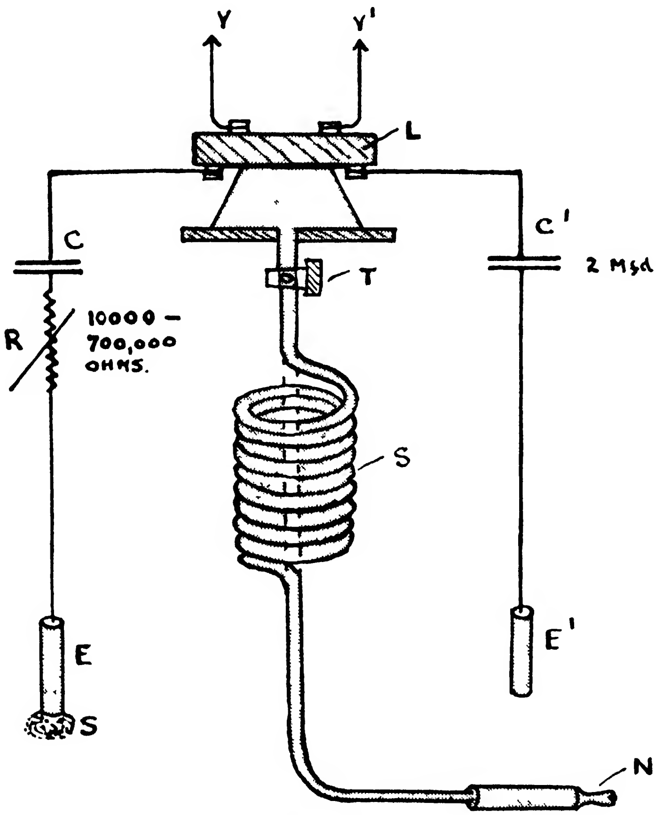

FIG. 6.

nerves, and these electrical stimuli are synchronised with the sound frequency, so that as the musical pitch increases, the rate of the applied electrical stimuli keeps in step ; *e.g.*, when twenty musical beats are applied to the ear, the nerves behind the ear receive twenty electrical impulses, and as the musical pitch is raised the electrical frequency rises in exact accord therewith. In addition to the application of simple pure notes and frequencies, chords and combinations of notes, with corresponding combinations of simultaneously applied electrical impulses can be administered.

Alternatively the patient can listen to a voice or music, and whilst doing so

receive corresponding complex electrical stimuli, embodying all the sound frequencies to which he is listening. Fig. 6 illustrates the additional apparatus required. The two small condensers C and C^1 insulate the patient from the electric mains, rendering him " earth free," but they pass the required electrical pulsations set up by the changes of E.M.F. across the loudspeaker.

This is an absolutely new and painless treatment, and it is too soon to make rash claims. I am testing it out entirely in collaboration with several doctors, who are sending me patients and agree that while it is likely to cause improvement in the selected cases it cannot do any harm. Obviously it will be of no use to a deaf person with a punctured ear drum, but as you will see from the few case records which I have brought with me this evening, selected from my patients, in several instances there has been considerable improvement. Figures 7, 8 and 9 are curves showing the effect of this treatment upon three different patients, and drawn from the figures supplied to me by the patients themselves, from measurements made by them in their own homes. Each patient is asked to test each ear separately, three times a day, by carefully measuring the limit of distance at which he can hear the ticking of a clock. Then, taking the average of the three readings, we plot our curves.

Case A (*Fig.* 7).—In this case, at the commencement of treatment the limit of hearing for the left ear was under 5 feet and for the right ear just under 15 feet. After the second treatment the hearing of both ears improved; the left ear limit reached 7½ feet, and the right ear limit about 17 feet, at which distance it thereafter remained practically constant. The hearing of the left ear, however, continued slowly to improve, and it is noticeable that each improvement took place after a treatment.

Case B (*Fig.* 8).—In this case there was very little difference between the two ears, and they both markedly improved.

Case C (*Fig.* 9).—This case showed no real improvement, but is interesting on account of the extraordinary variations which took place.

I only reproduce these curves as a matter of interest, many more need to be taken and much careful work done before the real worth of the treatment can be gauged.

In one case the patient could always hear certain notes better than others, indeed some notes were quite inaudible when she commenced. After a dozen or more treatments she was able to hear all notes, and although some still remained louder than others, their values were much more level.

Child's Delayed Sound Pulsations

I described the pulsophonic treatment to Mr. Maurice Child some time ago, and he suggested delaying the sound by passing it through a long length of tubing on its way to the ear. In this way it should be possible to stimulate the auditory nerves electrically, just *prior* to each musical impulse, instead of practically simultaneously as at present.

The coil of tubing marked S in Fig. 6, is Child's scheme for slowing up the

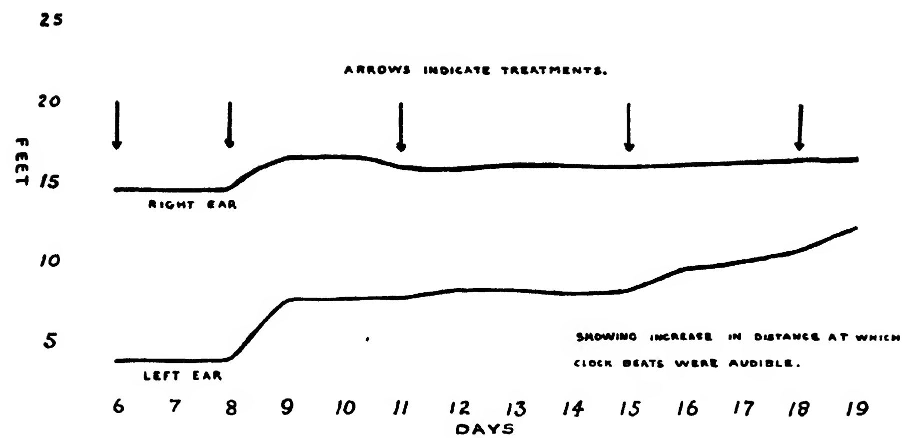

FIG. 7.—CASE A.

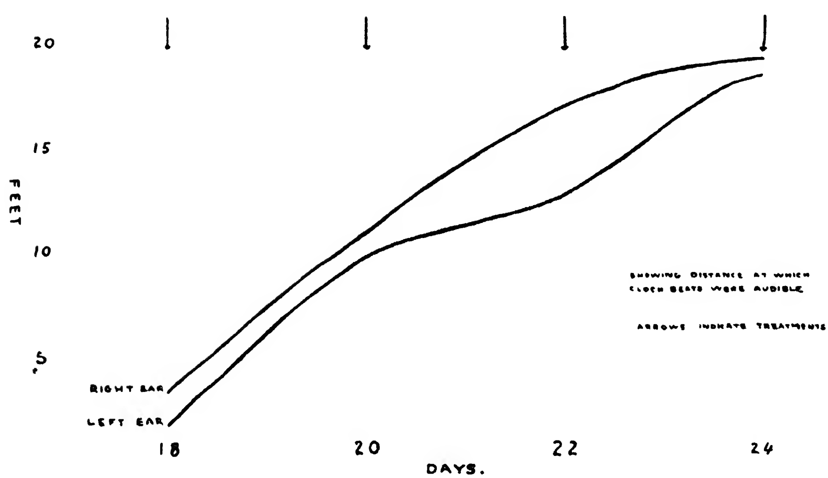

FIG. 8.—CASE B.

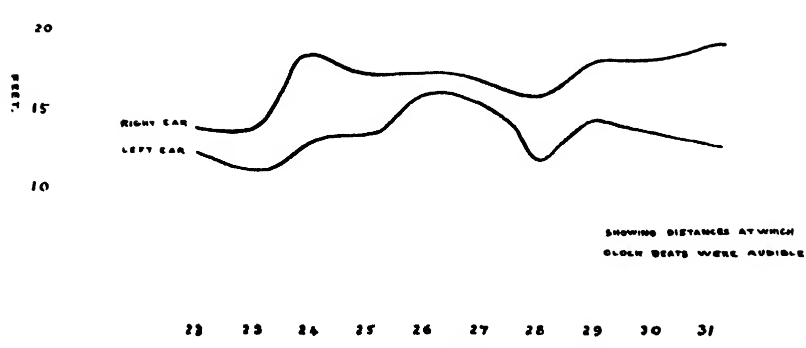

FIG. 9.—CASE C.

arrival of the sound impulses to the ear. Further reference to this figure shows the inclusion of a variable resistance R in one of the leads to the patient; this enables the intensity of the electrical impulses to be separately controlled. An ordinary gas tap T included in the tube controls the intensity of the applied sound pulsations. At the far end of the tube is a nozzle N for application to the ear. Electrode E^1 is held in the patient's hand, and a wet sponge electrode ES is applied behind the ear to which nozzle N is being held.

> *Experiment* 11.—Pulsophonic treatment was then demonstrated. A member of the audience was able to corroborate the fact that, as the notes to which he (and the audience) listened ascended, he felt the electrical impulses ascending in frequency in exact accord therewith. He also listened to and "felt" a tune which was played upon the radio-gramophone.

Model Illustrating Self-Induced and Displacement Currents

Fig. 10 is a diagram illustrating the model you see before you on the lecture table. I have made this up in order to illustrate the principles involved in the production of the "displacement currents" which are applied to the patients undergoing the "Pulsophonic treatment."

Mention was made in passing that the patient was connected through condensers to the two ends of the moving coil of the loudspeaker. Owing to the self-induction of its windings fluctuations of electro-motive force take place continually whilst the loudspeaker is producing music. The currents of self-induction set up thereby (sometimes spoken of as "back e.m.f.") are fed into condensers, where they give rise to displacement currents which in turn are applied therapeutically to the patient.

In our model, the moving coil of the loudspeaker is represented by a winding of insulated wire I (Fig. 10) round an iron core. B is a 2-volt battery and S a switch. As soon as the latter is closed, a steady flow of current takes place from the battery B through the windings of I, and finally returns to the battery. But for the two condensers C and C^1 which held it back, some of this steady and relatively gently flowing current would also flow up the leads N and N^1 and thence through the small electric lamp L at the top of the model. When the switch is suddenly released, a surge of self-induced current rushes up through the condensers and lights the lamp.

> *Experiment* 12.—The model was then shown in action. The electrical happenings were likened by the lecturer to the gentle raising of one end of a bath half filled with water. The water would run gently to the further end of the bath and none would be spilled. But the *sudden* replacement of the bath to its horizontal position would cause a back-wash of water which would overflow. The lecturer explained that it was a sudden back-wash of electrons (electricity) when the circuit was broken which caused the lamp to light. He then explained that none of the electrons in this surge of current actually passed through the lamp, the filament of the latter being heated by means of displacement currents from the condensers, whose action was to be explained as follows.

According to modern theory, free electrons are present in all metallic conductors, but they do not make their presence known outside until they are moved along by the application of an electro-motive force. Condensers C and C¹ behave towards electrons in a similar manner to that in which a thin rubber partition would act to the air on either side of it, if it were stretched over a window-opening in place of glass. In the presence of a steady wind, owing to its elasticity, the rubber would bow slightly inwards, but people within the room would not feel the wind, which would be effectively held back by the rubber partition. In the presence of a sudden gust of wind, however, the partition would *suddenly* bulge inwards and *displace*

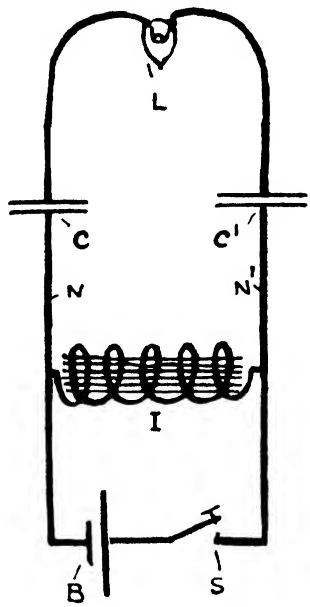

FIG. 10.

the air in the room, pushing it back into the room as a sudden pulse of air. None of the outside air would have entered the room, but a displacement current of air would nevertheless have passed across the room, driven by the energy applied from the gust of wind outside.

Before I close I should just like to mention that there are doubtless many other ways in which this heterodyning problem may be tackled. I have employed triode valves, whereas I understand the Electronde uses 4-electrode valves. Very probably some other type of valve may be better than either. Again, the stability of the oscillators can very possibly be improved by the use of crystal control of one or more of the circuits or by an adaptation of the Abraham-Block multivibrator. The possibilities are innumerable, and this field lies open for any amount of experimental research.

In conclusion. I particularly wanted you to hear heterodyne music played by Mr. André Ledor, and I am delighted to be able to tell you that he has very kindly

come here this evening, with his own accompanist, Miss Levitus, to give you a short recital of heterodyne music. I have had the pleasure of hearing him twice,—at a dinner at the Café Royale in Regent Street some time ago, and more recently at the Royalty Theatre. Having heard him, I think we are particularly fortunate to be favoured by his recital this evening. I should like to express my thanks to him for the ready acceptance he gave to my request when I invited him to play to us at the conclusion of my lecture, the more so as he was then a complete stranger to me. There are several other people, including his accompanist, Miss Levitus, to whom I wish to render thanks for their help this evening. I wish to thank my wife and Mrs. Ashley Scarlett. Then I wish to thank Mr. Maurice Child, not only for assisting with the experiments but for his work here throughout the afternoon in helping me fit up all this apparatus. My grateful thanks are also due to Messrs. McMichael for lending me this excellent radio set, complete with batteries, and for so kindly allowing me to re-arrange its internal connections to suit my experiments. I also wish to thank Mr. Forbat, of the Universal High Voltage Radio Co., for the loan of one of their powerful 7-valve Ostar-Ganz sets, which they not only lent to me but also altered to suit my requirements this evening.

The Chloride Electrical Storage Co. came to my rescue and lent me a 24-volt "Exide" battery, to boost up your supply voltage, and almost all the other batteries which we have been using this evening. Mr. André Ledor has asked me also to thank this same firm for supplying him with his batteries. He has also asked me to thank Messrs. Cossor for the loan of the wireless set on which he is going to play to you. I have also to thank Messrs. Chappell for the loan of this piano.

I am afraid I have had to weary you with rather a long list of names, but I can assure you that a great deal of the success of this evening's entertainment has resulted from their generosity and kindness.

Mr. André Ledor, accompanied on the piano by Miss M. Levitus, L.R.C.M., then gave a recital of Electronde music. He played the following :—

Le Cygne (*Saint-Saëns*)—imitating violoncello.

Berceuse (*Godard*)—imitating human voice.

Imitations of Hawaiian guitar and bassoon.

In conclusion, Mrs. Blake and Mr. Ledor played a duet on an Ethonium and an Electronde respectively.

REFERENCES

(1) Electrical Musical Instruments. R. W. P. Leonhardt. *Electrical Review*, March 9th, 1934 (vol. 114, pp. 339–340).

(2) Music from Electrons. Irving J. Saxl. *Radio News*, August, 1932 (vol. 14, pp. 74–76). This article describes Theremin's "Music from Air" instruments.

(3) New Equipment and Appliances. *The Electrician*, January 5th, 1934 (vol. cxii, No. 2901, p. 18).

(4) Radiometric Condensers and Inductances. G. G. Blake. *Journal of Royal Society of Arts*, December 22nd, 1933 (vol. lxxxii, pp. 154-180).

(5) The Trautonium. P. Kotowski and W. Germann. *Elektrische Nachrichten Technik*, November, 1934 (pp. 389-399).

(6) Electrical Organ Tones (containing details of Bourn's electrostatic organ). *Wireless World*, May 24th, 1935 (vol. xxxvi, No. 21, pp. 514-515).

(7) Tone Control. Brit. Pat. No. 344373. (See also description in *Experimental Wireless*, September, 1931 (p. 517).)

(8) Method for minimising the tendency for two oscillators to pull into step as zero beat is approached. *General Radio Experimenter*, April, 1934 (vol. viii, No. 11).

(9) Sand figure method of investigating the oscillation of cone loudspeakers. *Experimental Wireless*, June, 1934 (vol. xi, p. 328).

(10) The Cellulophone (apparatus for producing music by photo-electric cells). P. Toulon. *Rev. d'Acoustique* 3, May-July, 1934 (pp. 83-103) and November, 1934 (pp. 246-258). (See also *Science Abstracts*, April 25th, 1935, Sect. A, No. 1761.)

(11) Regulating Tone. Brit. Pat. No. 410119. H. L. Oura & Electrical & Musical Industries Limited. (See also *Experimental Wireless*, October, 1934 (vol. xi, p. 579).)

(12) Improvements relating to the electrical production of music. Brit. Pat. No. 410910, applied for January 18th, 1933, completed May 31st, 1934. The Allgemeine Elektricitats Gesellschaft.

(13) Stabilising Frequency. Brit. Pat. No. 411217. January 25th, 1933. (See also *Experimental Wireless*, November, 1934 (vol. xi, p. 635).)

(14) "Heterodyne Wavemeters," by E. Chatel. *Onde Elec.* 13. May, 1934 (pp. 231-236).

(15) Constant-frequency generators. Brit. Pat. No. 415716. E. B. Moullin & Marconi's Wireless Telegraph Company Limited. (See also *Wireless Engineer*, March, 1935 (vol. xii, p. 174).)

(16) Application of Electronics to the piano. B. F. Miessner. *Radio Club of America, Proc. II*, January, 1934 (pp. 3-14).

(17) Electrical Musical Instruments. M. Adam. *Rev. Gén. Electricité*, January 7th, 1928 (23, pp. 46-51).

(18) Some notes on the Stabilizing of High-frequency Power Amplifiers. J. Greig. *Journal of I.E.E.* (vol. 76, p. 702), 1935.

(19) Self-contained Standard Harmonic Wavemeter. D. W. Dye. *National Physical Laboratory Collected Researches* (vol. 18, part 13, pp. 229-272).

Some Historical Notes on Heterodyne Music

Leon Ssergejewitsch Theremin demonstrated "Music from the Air" in the Royal Albert Hall on December 12th, 1927.

Taubmann demonstrated the "Electronde" before the Golders Green and Hendon Radio and Scientific Society in 1933. His instrument was manufactured by The Electronic Music Development Company.

The "Martinot" Piano Electronde was demonstrated at Selfridges in March, 1934.

Lennington H. Shelwell (of America) demonstrated Theremin's music at the Comedy Theatre in January, 1935.

DISCUSSION

MR. ROLLO APPLEYARD said :—I must express my thanks to the lecturer and to the Royal Society of Arts for this remarkable demonstration. I was particularly struck by the explanation the lecturer gave of the phenomena in terms of electrons and the shape of the field. There is another way of contemplating what is happening, *i.e.*, by calling to mind the effect of modifications of any or all of the four fundamental quantities, resistance, capacity, inductance and leakance, by which the behaviour of every electric circuit is determined. It is here obvious that when the performers bring their hands nearer, or take them further, from the apparatus, they vary the capacity of the circuit, with consequent change of its electrical resonance, upon which the pitch and character of the musical response depend. They alter the capacity rhythmically very much as though they altered in like manner the thickness of the dielectric of a variable Leyden jar.

Our thanks are also due to Mrs. Blake and to the other performers who, with such skill, have given us so much pleasure.

THE LECTURER replied :—I thought I made it clear at the outset of the lecture that I was engaged in measuring the capacity of the condenser, and that we were using heterodyne circuits for measuring the capacity, but perhaps I did not make it clear that we were doing the same thing with the condenser of the musical apparatus.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, MAY 4..Engineers, Society of, at the Geological Society, Burlington House, W. 6 p.m. L. Hough, "**A Short History of Broadcasting.**"

Farmers' Club, at the Royal United Service Institution, Whitehall, S.W. 4 p.m. J. Wyllie, "**Farm Cost-Accounting.**"

Geographical Society, Royal, Exhibition Road, S.W. 8.30 p.m. Baroness Ravensdale, "**Persia in 1935.**"

Victoria Institute, at the Central Hall, S.W. 4.30 p.m. Rev. H. C. Morton, "**The Supposed Evolutionary Origin of the Soul.**"

University of London, at London School of Economics and Political Science, Houghton Street, W.C. 5 p.m. Prof. Dr. M. Bonn, "**The International Significance of the Colonial Problem. Lecture I–The 'Haves' and the 'Have-Nots.'**"

At University College, Gower Street, W.C. 5.15 p.m. Prof. R. M. Butler, "**Early and Mediaeval Irish Architecture.**" (Lecture I.)

TUESDAY, MAY 5..Civil Engineers, Institution of, Great George Street, S.W. 6 p.m. E. F. Relf, "**Modern Developments in the Design of Aeroplanes.**"

Central Asian Society, Royal, at 74 Grosvenor Street, W. Lieut.-Colonel S. H. Godfrey, "**In the Footsteps of Fa Hien in Upper Swat.**"

University of London, at King's College, Strand, W.C. 5.30 p.m. H. Wickham Steed, "**The Control of Central Europe : A Historical Survey.**" (Lecture I.)
5.30 p.m. Dr. N. Zernov, "**The Great Schism of the Russian Church in the Seventeenth Century.**"

At London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 5.30 p.m. Prof. A. Butenandt "**Biochemistry of the Sterol Group.**" (Lecture I.)

At University College, Gower Street, W.C. 5.15 p.m. Prof. R. M. Butler, "**Early and Mediaeval Irish Architecture.**" (Lecture II.)
5.30 p.m. Prof. C. J. Sisson, "**Sir Thomas More and his Circle : Some New Facts. Lecture I—More's Farm in Battersea.**"

WEDNESDAY, MAY 6.. Metals, Institute of, at the Institution of Mechanical Engineers, Storey's Gate, S.W. 8 p.m. C. C. Paterson, "**The Escape of Electricity from Metals : its Practical Consequences.**"

University of London, at University College, Gower Street, W.C. 5.15 p.m. Prof. R. M. Butler, "**Early and Mediaeval Irish Architecture.**" (Lecture III.)

THURSDAY, MAY 7..Chadwick Trust, at the Royal Institute of British Architects, 66 Portland Place, W. 8 15 p.m. Prof. S. D. Adshead, "**London under Statutory Town Planning.**"

Electrical Engineers, Institution of, Savoy Place, W.C. 6 p.m. Dr. E. Mallett, "**Television—an Outline.**"

Philosophy, British Institute of, at University College, Gower Street, W.C. 5.45 p.m. Prof. E. Barker, "**The Romantic Factor in Modern Politics.**"

University of London, at Bedford College for Women, Regent's Park, N.W. 5.15 p.m. Prof. Sir E. Poulton, "**Ants.**"

At London School of Hygiene and Tropical Medicine, Kepple Street, W.C. 5.30 p.m. Prof. A. Butenandt, "**Biochemistry of the Sterol Group.**" (Lecture II.)

At University College, Gower Street, W.C. 5.30 p.m. Vice-Admiral Sir B. Domvile, "**Naval Strategy.**" (Lecture I.)

At the Royal Veterinary College, Great College Street, N.W. 5.30 p.m. Prof. Dr. H. Dryerre, "**Mineral Deficiency Diseases of Farm Animals.**" (Lecture I.)

FRIDAY, MAY 8..Mechanical Engineers, Institution of, Storey's Gate, S.W. 7 p.m. J. Hornsby, "**Power Transmission by Belts.**"

Royal Institution, 21 Albemarle Street, W. 9 p.m. Sir William Bragg, "**The Electric Properties of Crystals.**"

Sanitary Engineers, Institution of, at Caxton Hall, S.W. 6 p.m. Dr. F. M. Lea, "**The Deterioration of Concrete due to Chemical Attack.**"

University of London, at London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 5.30 p.m. Prof. A. Butenandt, "**Biochemistry of the Sterol Group.**" (Lecture III.)

At the Royal Veterinary College, Great College Street, N.W. 5.30 p.m. Prof. Dr. H. Dryerre, "**Mineral Deficiency Diseases of Farm Animals.**" (Lecture II.)

JOURNAL OF THE ROYAL SOCIETY OF ARTS

No. 4356 *FRIDAY, MAY 15th,* 1936 VOL. LXXXIV

All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

MEETINGS OF THE SOCIETY

NEXT WEEK

WEDNESDAY, 20TH MAY, at 8 p.m. (Ordinary Meeting). PHILIP A. DE LASZLO, M.V.O., "The Art of our Day." (Illustrated by lantern slides.) THE RIGHT HON. VISCOUNT ULLSWATER, P.C., G.C.B., will preside.

DOMINIONS AND COLONIES SECTION

Fellows of the Society are requested to note that the paper on "Insect Damage to Empire Products," by J. W. MUNRO, M.A., D.Sc., Professor of Zoology and Applied Entomology in the University of London, which has been announced in the *Journal* to be delivered on May 19th, will be read a week later, on Tuesday, May 26th. The Chair will be taken by SIR DAVID CHADWICK, C.S.I., C.I.E., Secretary, Imperial Economic Committee and Imperial Agricultural Bureaux.

CANTOR LECTURES

Reports of the following Cantor Lectures in pamphlet form are now available and may be obtained on application to the Secretary :—

" Geological Aspects of Underground Water Supplies." By Bernard Smith, M.A., Sc.D., F.R.S., F.G.S. 2*s*. 6*d*.

" Nutrition and National Health." By Major-General Sir Robert McCarrison, C.I.E., M.D., LL.D., F.R.C.P. 2*s*. 6*d*.

"Lettering and its Uses To-day." By Percy Smith. 2*s*.

LIST OF FELLOWS

The new edition of the List of Fellows is now ready, and copies can be obtained on application to the Secretary.

PROCEEDINGS OF THE SOCIETY

FIFTEENTH ORDINARY MEETING

ALDRED LECTURE

WEDNESDAY, 11TH MARCH, 1936

HUBERT LIDBETTER, F.R.I.B.A., in the Chair.

The Secretary explained that Sir Raymond Unwin, who was to have taken the Chair, had unfortunately been prevented from doing so at the last moment, and Mr. Hubert Lidbetter had kindly consented to take his place.

THE CHAIRMAN, in introducing the lecturer, said :—I have great pleasure in presiding at the meeting this evening on such an interesting subject, one of which I think I may safely say some of us here have a great knowledge. Others may not know so much, and some of us are profoundly ignorant of it. I would have pleaded ignorance some years ago because it was not part of my curriculum when I was practising, but my attention was drawn to it seriously, when I was called upon to design a large building involving important acoustical problems. The subject is indeed a quite modern one, and one that anybody may be pardoned for not being really *au fait* with. I will not, however, trouble you with my experiences in the work I carried out then, but nowadays I may say that instead of its being a subject which is neglected and misunderstood by everybody it is one of the necessary subjects in the curriculum for the education of architects.

The following paper was then read :—

THE ACOUSTICS OF HALLS

By G. W. C. KAYE, O.B.E., M.A., D.Sc.,

Superintendent, Physics Department, National Physical Laboratory, Teddington, Middlesex

The folly of erecting auditoriums, however beautiful and dignified, in which it is impossible to hear either speech or music to advantage is becoming recognized. There are very many halls in this country, particularly those domed monuments erected in prosperous times a generation ago, the acoustics of which are lamentable. Not that certain modern halls are much better, though there are, of course, notable exceptions among both old and new. The view that good auditorium acoustics is a pure gamble, if not an Act of God, certainly a gift of the gods, was long cherished. It is said that an eminent architect used to claim that he had never built a hall with bad acoustics, whereas, in point of fact, he had built dozens.

In churches there is an inherited tradition of reverberant acoustics, but in halls intended for lectures or music the audience should not be given an excuse for letting its attention wander simply because it has to strain to follow the proceedings. The public will complain if it is given seats behind pillars so that it cannot see well ; it is beginning to realise that it has a legitimate grievance if it is given seats where the hearing obviously should be good and is demonstrably very bad. The whole subject

has come very much to the fore in connection with the countless picture theatres which have sprung up, and though the requirements of the "legitimate" theatres are not quite the same, some of the more recent ones do not appear to have profited, to judge by criticisms they have received. Others are extremely good, for example, the Shakespeare Memorial Theatre at Stratford, in which one can hear splendidly, even in the most remote seats of the gallery.

Thanks mainly to the pioneer work of W. C. Sabine and the American school of workers, together with that of Hope Bagenal and others in this country and in Germany, architectural acoustics is no longer shrouded in mystery and empiricism, but is a science of which most of the physical principles are simple and well established and the practical outcomes are mainly predictable. It is well that the major principles should become common knowledge, so that new buildings shall not continue the evil acoustic traditions of the past: it is certainly not wise to wait until a building is finished, since remedies applied after erection are likely to be troublesome and unsatisfactory.

In the meantime there are grounds for encouragement, and the architectural profession is, I should imagine, no longer likely to embark on a big building project without seeking advice on the several acoustical aspects. This is exemplified by the new Palace of the League of Nations in which the acoustics of the large Assembly Hall (with a volume of 700,000 c. feet and seating some 2,000 persons), have been entrusted to the Architectural Acoustics Committee of the Department of Scientific and Industrial Research.

Architectural acoustics is bound to continue to make important progress in this country. The most effective channel for guiding the public is through the architectural profession, though the general acceptance of the physical principles will be much accelerated if the interest and collaboration of the engineer, the artist and the decorator are also secured. The acoustical engineer of the future will in fact be required to have a working acquaintance with all these arts, if his work is to be acceptable to the public.

Sound is the audible expression of a mechanical disturbance of some kind or other, and once produced in a confined space it will continue until it reaches the boundaries, where it will be reflected or transmitted to an extent depending on the conditions. The quality of a sound is bound up with its composition, the components of low frequency usually giving volume and deciding the pitch which we assign to the mixture, while the high tones give character, particularly in speech, and are the ones which help us to identify the source or the nature of sounds.

It may here be noticed that the composition of a sound when it reaches the hearer may differ appreciably from that which it had originally. For example, the high-pitched components with short wave-lengths may be regularly reflected at the boundaries, or abnormally absorbed either there or by the air itself, particularly if it is humid. The latter effect is due, as Knudsen has shown, to interaction between the oxygen and water molecules in the air, the nitrogen playing no part. On the other hand, the low tones, with wave-lengths which are large compared with the

size of most of the objects encountered, are scattered in all directions rather than reflected. It is part of the province of the architect to preserve the balance between the high and low tones, so that speech and particularly music are everywhere received in a hall with their original natural quality, as far as may be possible.

The problem of good acoustics in halls, whether for speech or music, is, I think, best approached from an energy standpoint. First of all we ought to realize that the energy available, particularly in speech, may be very prescribed. The power of the average human voice has been measured and found to be very small, no more

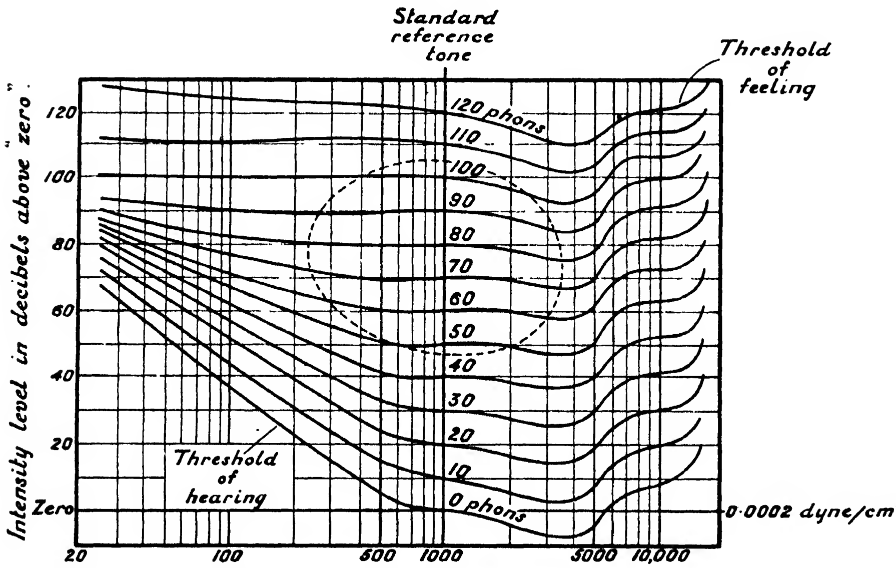

FIG 1.—AUDITORY DIAGRAM OF EAR SHOWING LOUDNESS CONTOURS FOR DIFFERENT FREQUENCIES. FREE-AIR CONDITIONS. (*Fletcher & Munson*, 1933.)

than about 10 microwatts during normal conversation, about 100 microwatts when talking loudly, and about 1,000 microwatts when shouting.

As regards music, an average figure for a soloist or a single instrument is perhaps 100 microwatts or more, which may be increased five or tenfold in a very large hall and may on occasion be much less. An orchestra of seventy-five players has a normal output of about ½ watt (the bass drum claiming some sixty per cent.) which may rise to 50 watts in stirring passages.

More significant than the energy is the degree of loudness of a sound, and so we had better spend a moment on the methods of measuring loudness. In common with pitch and timbre, loudness is a subjective feature which is appraised solely by the ear. We can measure the energy of a sound instrumentally by means of a microphone and amplifier which have been calibrated by a Rayleigh disc. Now the

auditory diagram of the ear (Fig. 1) shows that while loudness is clearly related to energy, the two do not normally keep in step, especially for high and low frequencies, so that an energy meter, such as a microphone, cannot unreservedly be used as a direct measurer of loudness.

The situation is met by establishing a reference scale of loudness obtained by operating a pure tone of specified frequency by a progressive scale of measured steps of energy. On the British Standard scale the reference tone has a frequency of 1,000 cycles per second and an arbitrary " zero " of energy near the " threshold " of hearing. If the reference tone is increased in successive *decibel* (db.) steps of energy above the zero, the resulting changes of loudness are expressed in numerically identical steps on a scale of *phons*. The equivalent loudnesses of other sounds are evaluated by matching them by ear against the suitably adjusted reference tone, the numerical value of the latter in phons then giving the loudness of the sound matched. Incidentally, a phon is approximately the smallest change of loudness detectable by the ear in the case of sounds of medium frequency and loudness. On the British Standard scale, quiet conversation has a loudness of about 60 phons, loud conversation 70 phons, a busy typing room 90 phons, and a loud motor-horn 100 phons.

A glance at Fig. 1 shows that in the centre of the diagram (within the dotted circle) the phon contours are roughly horizontal and parallel, so that over a wide range of pure tones from, say, 200 or 300 to 3,000 or 4,000 cycles, and of intensities from, say, 40 or 50 db. to 90 or 100 db. the loudness level in phons is approximately equivalent numerically to the intensity level in decibels. As many every-day noises are largely made up of components within these ranges and have their maximum level between 500 and 1,000 cycles, a similar relation may hold sufficiently well for such noises if there is not undue intermasking between the components.

It may be explained that a " bel " represents a tenfold increase in energy, while each decibel signifies approximately a 5/4 increase, two decibels a $(5/4)^2$ increase, and so on, ten decibels being exactly equivalent to a bel. A logarithmic unit such as the decibel, is essential in dealing with the enormous energy range of the ear, which amounts to 10 million millionfold for notes of medium frequency.

The British Standard scale is set out in Table 1. Fuller details may be obtained from the " *British Standard Glossary of Acoustical Terms and Definitions*," which can be obtained from the British Standards Institution.*

As might be anticipated, the loudness of a sound has a great influence on the ease with which we comprehend it. Hearing is most satisfactory at a level of about 70 phons, that is, near the speech level, and rapidly deteriorates at lower levels (Fig. 2). In very large halls, it is rarely, if ever, that the unaided voice could succeed in maintaining such a level throughout the hall.

The criterion of " satisfactory hearing " is derived from articulation tests, a method borrowed from the telephone engineer and now much used in exploring

* A notice of this work will be found on p. 699 of the present *Journal.*

TABLE I

British Standard Scale of " Equivalent Loudness "

Reference tone.—1,000 cycles per sec. ; plane wave in free air.
Zero.—0·0002 dyne per sq. cm. (near threshold of audibility).
Listening.—With both ears ; observer facing source.

Intensity of reference tone		*Loudness of reference tone in phons*	*Popular description*
In terms of the " zero " intensity	*In decibels above zero*		
1	0	0	Silence
10	10	10	
10^2	20	20	Quiet
10^3	20	30	
10^4	40	40	
10^5	50	50	Moderate
10^6	60	60	
10^7	70	70	
10^8	80	80	Loud
10^9	90	90	
10^{10}	100	100	
10^{11}	110	110	Very loud
10^{12}	120	120	
10^{13}	130	130	

auditorium acoustics. In these tests, a number of meaningless syllables are called out by the speaker, and the percentage which the hearer sets down correctly, gives a quantitative measure of the hearing at the point where he is situated. For example, a percentage articulation of 90 per cent is accounted very good, one of 75 per cent. still permits intelligent understanding by the hearer, while one of 65 per cent. or less denotes unsatisfactory hearing conditions. Articulation test lists are available which fairly represent the average proportions of vowel and consonant combinations in ordinary speech. Sometimes well-known monosyllabic words are employed for articulation tests, a simpler method we owe to Fletcher and Steinberg.

The next factor of interest is the distance range of the human voice. Making use of the articulation method of test, Knudsen made measurements in the open air on a quiet level plain with no wind, and found that normal speech could be heard satisfactorily at about 120–130 feet in front of the speaker, 90–100 feet on either side, and 50–60 feet in the rear, the asymmetry being another illustration of the fact that the high-pitched components, on which intelligibility largely depends, are very

directive. These distances, which would seem to apply to very favourable conditions, should be no less but rather be exceeded in a quiet hall, where, owing to reflections from the boundaries, sound will normally die away less rapidly than is required by the inverse square law. It is evident that such considerations will help to prescribe a limit to the size of building which can be adequately " filled " with the unaided voice.

In passing, it may be surmised that the hearing in the remote seats in the larger open-air Greek and Roman theatres, which were as much as 200 feet away from the stage, could not have been satisfactory, though it must be remembered the seats were terraced and the actors had a reflecting rear wall and frequently made use of

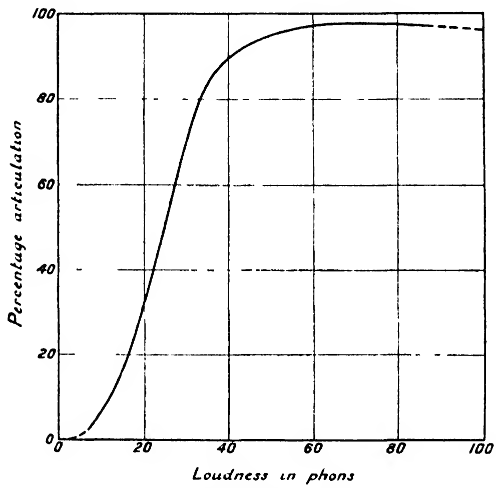

FIG 2.--RELATION BETWEEN LOUDNESS LEVEL AND PERCENTAGE ARTICULATION FOR SPEECH. (*Steinberg.*)

megaphonic masks. An audience of 20,000 could be accommodated in the larger theatres, a number that is only exceeded in a modern arena by the Hollywood Bowl near Los Angeles, which, however, has a large parabolic reflector (90 feet across) and, although primarily intended for instrumental music, affords satisfactory hearing of speech 200 feet away. There is a replica of an open-air Greek theatre in this country at Bradfield College.

Now, what are the requirements for satisfactory hearing in a hall ? They are very simple, as Sabine pointed out nearly forty years ago :—

(1) There should be freedom from troublesome extraneous noise.

(2) The shape and size of the hall should be such that the loudness of sounds is everywhere adequate and uniform.

(3) There should be appropriate degrees of reverberation throughout the speech and music ranges of frequencies, so that (*a*) rapidly succeeding sounds do not overlap unpleasantly, and (*b*) the original quality of speech and music is not impaired.

(1) Extraneous Noise

A hall should preferably be situated in a quiet locality free from busy traffic. The problem of noise exclusion is one to which the Department of Scientific and Industrial Research is at present giving much attention at both the National Physical Laboratory (Fig. 3) and the Building Research Station. Air-borne sounds are best kept out either by massive single walls or lighter composite walls of suitable design : high notes are easier to stop than low. Leakage through cracks or poor joints may nullify the effectiveness of sound-proofing arrangements. Impact noises are isolated by interposing discontinuity or elastic resiliency somewhere in the structure.

It is important that the windows of a hall should look out on quiet areas, as the insulating value against air-borne noise of a wall containing even a small window approximates more nearly to that of the window than that of the wall. If there is much external noise, the windows should be of thick or double glass of correct spacing* and should not be opened when the hall is in use, otherwise the insulation becomes almost negligible. For such cases, artificial ventilation may be required, in which event the ventilation ducts should be lagged to prevent fan noises reaching the hall. Silent motors are now available. A double set of silent well-fitting doors will help to prevent the intrusion of external noises from outside corridors, the floors of which should be covered with linoleum or carpet with an underlay of felt or fibre board.

The problem of excluding external noise from a hall is of course bound up with the degree of internal noise which prevails. Every hall when in service has a general noise level of its own, which varies according to the conditions, so that the precautions to exclude external air-borne noise need be no more than will ensure that the intruding noise will be effectually masked by the existing noise. Knudsen's measurements indicate that the intruding noise will be unnoticeable if its level is some 15 to 20 phons below that in the hall. For example, if the noise level in the hall is 30 phons, an external noise of 80 phons will not be a nuisance if the sound proofing of the walls is such as to reduce the noise on the average by about 65 phons. Masking by low-pitched notes is more pronounced than by high.

Internal noise in a hall may be much reduced by covering the gangways, etc., with rubber, linoleum or, better still, carpet with an underlay of felt or fibre board. If such a treatment is extended all over the floor, the noise of feet shuffling will be largely abated. Benches or chairs should be of the non-creaking variety. If an audience is made comfortable, it will be less restless, even when its attention is beginning to wander. Incidentally, restlessness is almost inevitable if the audience cannot see very well. The solution to this latter is a raked or terraced floor and a raised platform, features which are not always possible in general utility halls but have the additional merit of reducing transverse room resonances. Furthermore, heavily upholstered seats have acoustical merits from a reverberation point of view, as we shall see presently.

* See Constable, *Phil. Mag.* 18, p. 321, 1934.

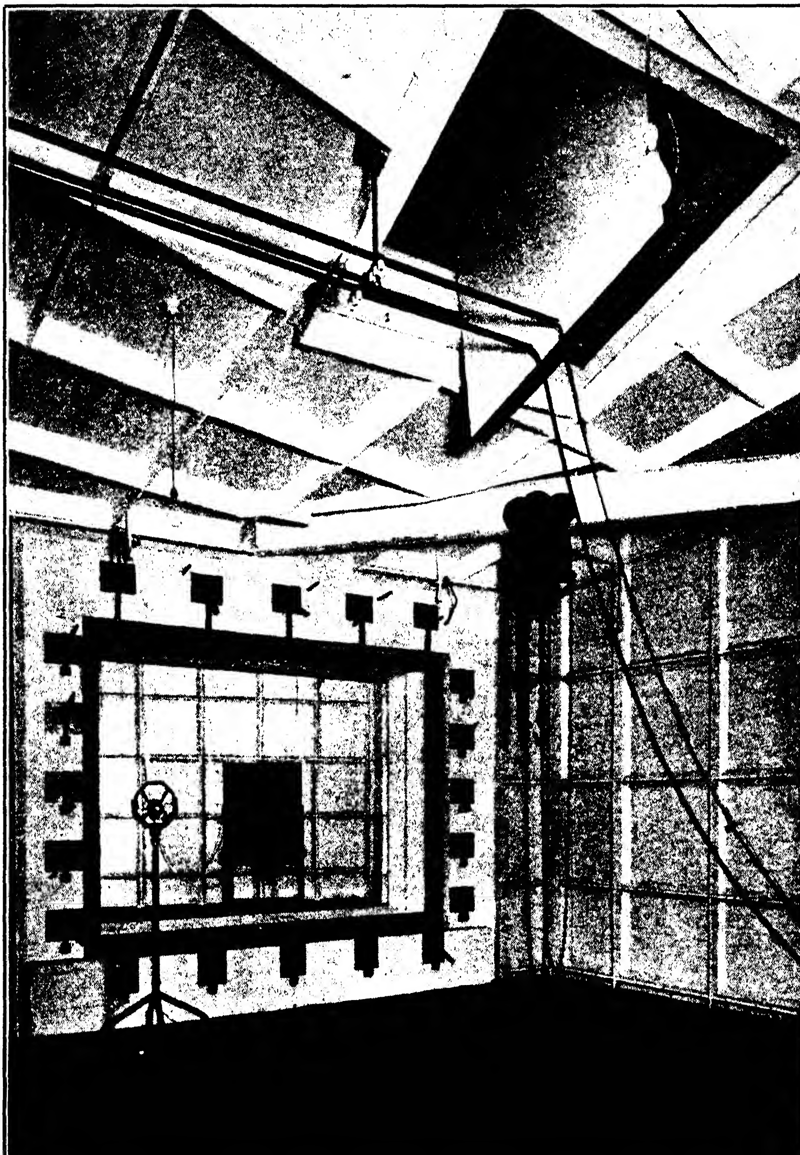

Fig. 3.—Transmission Rooms at the National Physical Laboratory, for Measuring the Sound-proofing Values of Walls and Partitions. (*From the Report of the National Physical Laboratory*, 1934. *By courtesy of H.M. Stationery Office.*)

(2) SIZE AND SHAPE OF A HALL

It may be taken as a cardinal creed not to build a hall any larger than is likely to suffice for its normal purposes. As already remarked, there is a limit to the capacity of the unaided voice. The following are a few acoustical maxims for the designing of halls :—

(*a*) Short broad halls are preferable to long narrow ones.

(*b*) Keep the ceiling low so that it can be used as a reinforcing reflector. If possible, restrict the height to not more than about 30 feet and so prevent echoes, which arise with a path difference of 70 feet or more, *i.e.*, when the reflected ray lags behind the direct ray by 1/16 sec. or more.

(*c*) Choose a design which will promote even distribution of sound, that is, one free from focussing and multiple reflections. Avoid therefore large concave surfaces, such as semicircular or elliptical walls, domed ceilings or barrel vaulting. These may cause very troublesome effects, particularly if the centre of curvature is situated in the audience.

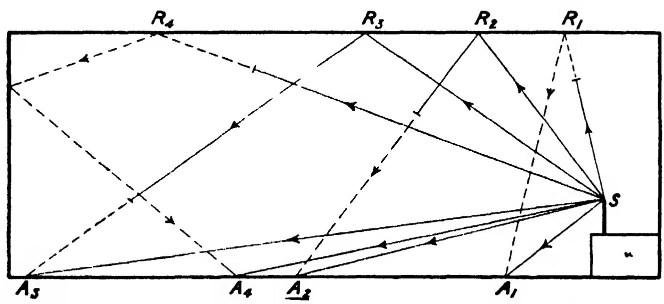

FIG. 4.—REFLECTION OF SOUND FROM A HIGH CEILING PRODUCING INFERIOR HEARING IN THE MIDDLE OF A HALL AS COMPARED WITH THE FRONT AND BACK. (The dotted portions of the tracks represent the degree of lag behind the direct sound.)

(*d*) Make full use of large smooth reflecting surfaces behind and near the platform, for example by splaying the side walls and ceiling.

(*e*) Arrange for the floor and the remote wall to be sufficiently absorbent to prevent undesirable reflections.

Long and relatively narrow rectangular halls with a high ceiling and the platform at one end are very common in this country, for example in University Halls. One of the features is that hearing is often poorest in the central region, a defect determined jointly by the degree of delay of the reflection from the ceiling, and the strength of the direct sound compared with that of the echo (Fig. 4). Close to the platform, the direct sound dominates the echo, and far away, the delay of the echo is sufficiently reduced to render it harmless. It is clear that in such halls it will be beneficial to line the far wall and the remote half of the ceiling with absorbent, but to leave the end of the hall near the speaker reflecting.

A properly designed ceiling is by far the most effective reinforcer of sound by

reflection. The principle is exemplified very well by a comparison of the House of Lords and the House of Commons, which were erected in 1848. Both Houses were given very high ceilings and their acoustics were manifestly bad. The complaints in the Commons were so great that the chamber was fitted after two years with a false glass ceiling about 35 feet high, a remedy which was completely successful. The volume is now 127,000 c. feet and the reverberation period with a full house about 1·5 secs.

In very large halls, it may be difficult or impossible to avoid surfaces, which by single or multiple reflection, produce echoes. In such cases, the offending surfaces may be treated with absorbents or broken up by deep panelling or coffering. Another plan, which is sometimes adopted, is to suspend velaria or mattresses of absorbent (with a suitably decorative covering) in convenient regions where rays of sound converge, for example, at the centre of curvature of barrel vaulting. Such

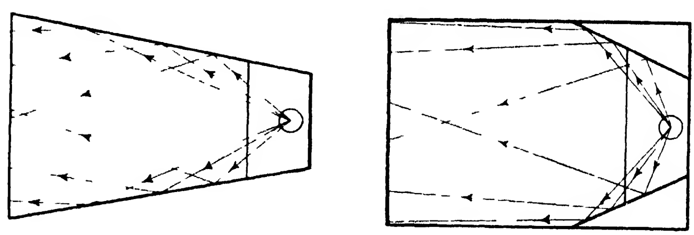

Fig. 5.—Halls Designed for Good Hearing showing completely and partially Splayed Side Walls. A Splayed Ceiling over the Platform is also Advantageous.

absorbent is moreover nearly always useful from a reverberation point of view. Alternatively, the original beams of sound may be deviated near the source by means of large sounding boards, or, in large halls, by the proper placing of directional loud-speakers.

Good acoustical designs of halls are shown in Fig. 5 where the side walls are splayed partially or completely, so affording beneficial reflections for the back seats The ceiling, which should not be too high, can also be advantageously splayed at the platform end, so that it will act as a large sounding board.

Sometimes the boundary contours are more elaborate, in order to promote uniform hearing, particularly in and under galleries, as, for example, in the Salle Pleyel (volume 800,000 c. feet), a concert hall in Paris, the reflecting ceiling of which consists of sections of parabolas (Fig. 6). Unfortunately such designs are not "one-way," and, as was found with parabolic reflectors in a number of English churches over 100 years ago, the collected noises from the congregation, and possibly their comments, were apt to embarrass or annoy the preacher. In the Salle Pleyel this defect is largely overcome by extensive application of acoustic absorbents near the audience. The reverberation is small and the acoustics are described as excellent. The hall seats an audience of 3,000.

The acoustical features of a hall are bound up with the various paths of the sound rays between the source and the hearer. A survey in three dimensions of the possible paths would be a formidable matter in some cases. At the National Physical Laboratory, we have used the analogous method of reflected light applied to three-dimensional scale models. A large number of small mirrors are mounted on the interior walls of the model, and a small bright source of light replaces the source of sound. Each mirror forms its own image so that the tracks of the reflected rays are rendered visible. The method takes no account of the spreading which sound

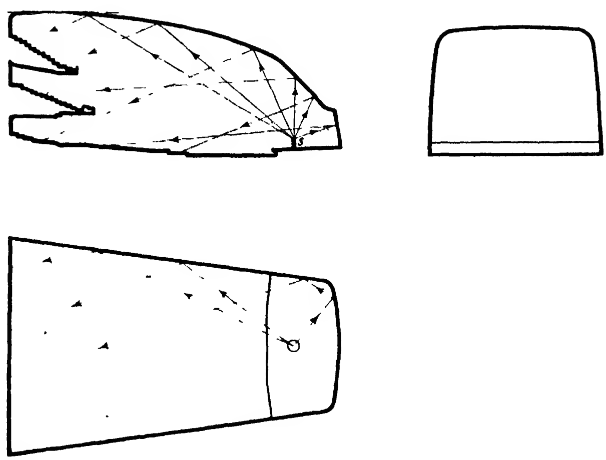

FIG. 6.—THE SALLE PLEYEL IN PARIS, SHOWING SPLAYED AND INCLINED SIDE WALLS AND PARABOLIC CEILING. LENGTH EXCLUDING STAGE 164 FEET ; WIDTH 68–102 FEET ; MEAN HEIGHT ABOUT 64 FEET.

waves experience by diffraction, but such models are capable of providing a visual demonstration of some of the acoustical defects due to reflection.

I have here a sectional scale model of the Albert Hall. The hall is, of course, very large (some 3 million c. feet), and will hold 8,000 or more people. It is elliptical in plan (219 feet by 185 feet) with a concave ceiling 137 feet high, so that pronounced focussing and echoes occur. The model displays the beneficial effect on the focussing of installing a (convex) velarium of sailcloth under the ceiling. There is a good deal of absorbent in the hall, and the reverberation period with a full audience would appear to be about 2·2 secs., a quite acceptable figure for so large a hall.

As alternatives to the three-dimensional model, methods of studying wave propagation in two-dimensional scale-models of halls have been developed. The three-dimensional characteristics can often be deduced if such studies are made in the three main directions, *i.e.*, in plan and vertical sections (both longitudinal and transverse).

There are three principal methods* of studying the reflecting characteristics of two-dimensional sections of the interiors of halls.

(i) From simple geometry.
(ii) From sound-pulse photography in scale models.
(iii) From water-ripple photography in scale models.

The geometrical method is based upon the simple laws of reflection as already demonstrated. It is very frequently used for predicting the general directions of sound beams and of echoes in a hall, though it does not deal with the spreading due to diffraction. This latter effect is, however, displayed by both the experimental methods and enables them to reveal defects of shape which might not be inferred from a geometrical study. In the model experiments care must be taken to preserve, at any rate approximately, the relative proportionality of the dimensions of the actual hall and the mean wave-length of speech and music.

The use of water ripples depends upon their approximate analogy under appropriate conditions to sound waves. At the National Physical Laboratory the model, which is usually made of wood to a scale of from $\frac{1}{8}$ to $\frac{1}{4}$ inch to 1 foot, rests on the glass bottom of a ripple tank which is illuminated from below. The depth of the water is a little under 1 inch and the wave-lengths of the ripples are of the order of $\frac{1}{2}$ inch or more, which correspond to sound waves with wave-lengths of the order of 2–4 feet. The ripples are started by a small dipping rod at the point occupied by a speaker in the hall, and their progress can be followed either visually or photographically, so that the relative merits of different sections can be rapidly appraised. The utility of the demonstration is restricted not only by the fact that ripples cannot be generated singly, but that they die away so rapidly that not more than one reflection can be followed. Fig. 7 shows some ripple-tank photographs of a section resembling that of the House of Commons.

Much clearer results can be obtained by the method of sound-pulse photography. The shadow of an intense single sound pulse, which is generated by the sudden discharge of an electrical condenser, is photographed (or viewed visually on a ground-glass screen) by means of an electric spark timed to follow the start of the sound pulse after a precontrolled interval. The progress of the pulse, even after several reflections, can thus be followed within the model, corresponding in the National Physical Laboratory apparatus to a range of paths in an actual hall up to about 150 feet. The model, which is usually made of ebonite, is quite small, the scale ranging from $\frac{1}{12}$ to $\frac{1}{96}$ inch to the foot. Fig. 8 shows some sound-pulse photographs which illustrate how the coffering of a ceiling can correct by interference the focussing effects of a concave ceiling.

The necessity for amplifying the speech energy in large halls has already been referred to. According to Knudsen, a loud-speaker is essential in most halls if the volume exceeds 100,000 c. feet and even in smaller halls which are troubled with much extraneous noise or when a speaker has a weak voice. During the last few

* See Davis and Kaye, *The Acoustics of Buildings* (Bell), for a full discussion.

years the use of loud-speakers has become general, and in spite of inherent shortcomings there can be no question as to their indispensability in very large halls enabling, as they do, many to hear who otherwise would hear little or nothing. It is not that loud speakers are a palliative for excessive reverberation: on the contrary, they are heard to best advantage when reverberation and echoes are reduced to a minimum.

There are many technical aspects in connection with loud-speakers which are

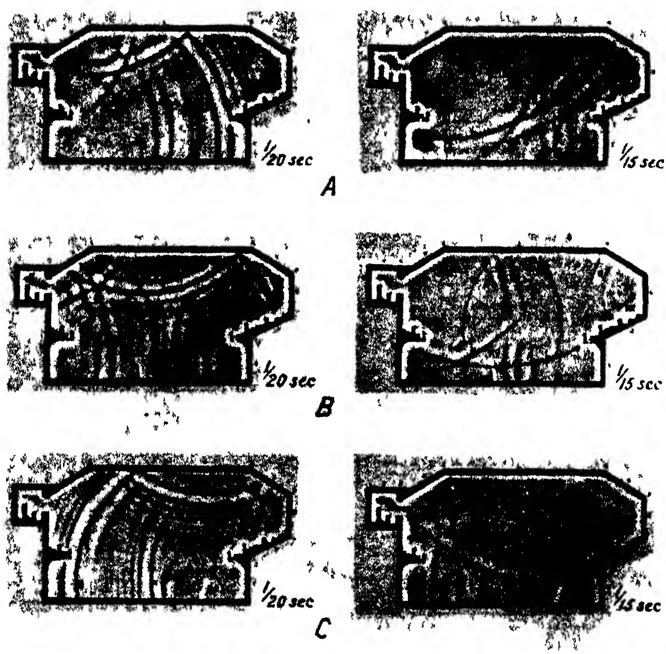

FIG. 7.—CONTRASTING SUCCESSIVE STAGES IN PROGRESS OF WATER-RIPPLES STARTED FROM DIFFERENT POINTS IN A SECTIONAL MODEL RESEMBLING HOUSE OF COMMONS. (A) NEAR SPEAKER; (B) MIDDLE OF HOUSE, (C) REMOTE FROM SPEAKER.

best left to those who manufacture and install such equipment, but one or two general points may be made. For natural effect the loudness should not exceed speech level, so that the amplification should be no more than will enable remote hearers to hear satisfactorily. The loud speakers should therefore be sufficiently directional to avoid excessive loudness for hearers near to them. If they are placed well above the head of the speaker himself, the majority of the audience will be conscious of only one source of sound. Care should be taken when supplementary loud-speakers are mounted in remote parts of a hall where hearing is poor, for example, under galleries, as when loud speakers are separated by more than about

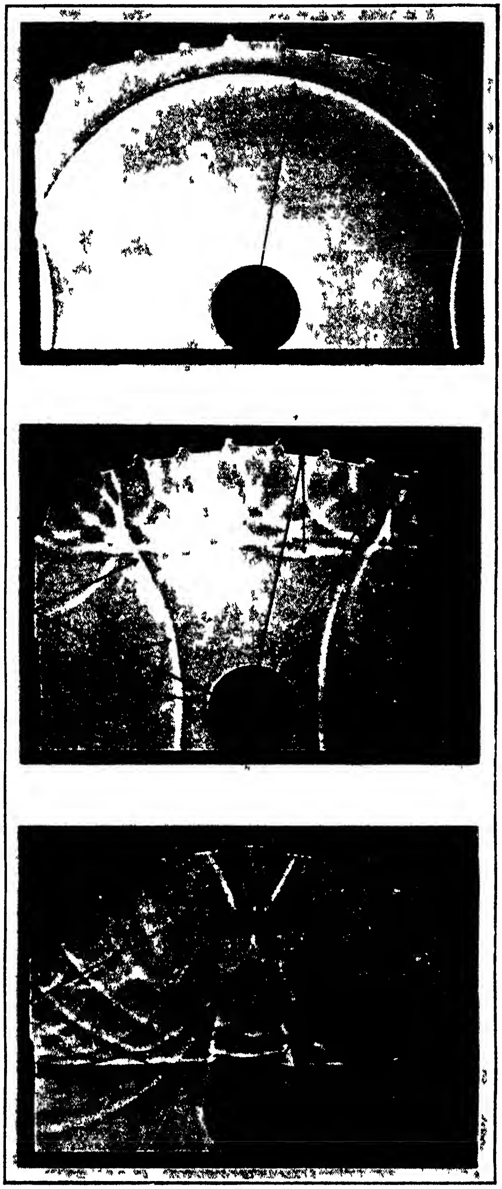

FIG 8—SOUND-PULSE PHOTOGRAPH ILLUSTRATING THE VALUE OF COFFERING A CONCAVE CEILING, AND SO PREVENTING BY INTERFERENCE OBJECTIONABLE FOCUSSING EFFECTS (*From Davis & Kaye's* ACOUSTICS OF BUILDINGS *By courtesy of Messrs G Bell & Sons, Ltd*)

70 feet, objectionable duplicating of sounds, resembling echoes, may result in some regions.

(3) Reverberation

Reverberation is due to multiple reflection of sound by non-absorbent boundaries. It is an unknown phenomenon in the open air, but is familiar to all of us in large empty rooms and particularly in cathedrals. Excessive reverberation, which is probably responsible for nine-tenths of the acoustic defects of large halls, can be cured, as Reid pointed out 100 years ago, by introducing acoustic absorbent. Dickens in *Martin Chuzzlewit* spoke of " storehouses which had an air of palpable deadness about them, being filled with wool and cotton and the like—such heavy merchandise as stifles sound and stops the throat of echo "

In a hall with hard rigid boundaries, such as painted hard plaster, sound may suffer only about 2 per cent. loss by absorption at each reflection, and so the reflections are likely to be numerous before the sound is dissipated. If the sound is generated at a steady rate, the average intensity level will build up until it reaches an equilibrium value, in which the rate of absorption balances the rate of supply of energy. If now the sound is suddenly stopped, the sound will die away at a rate determined by the size, shape and nature of the boundary surfaces of the hall. In the reverberation chamber at the National Physical Laboratory (Fig. 9), sounds of low pitch continue for about 15 secs. (which is as long as in some cathedrals), during which time the sound travels over three miles and is subjected on the average to some 1,200 reflections. On the contrary, in another room at the Laboratory, which is lagged with thick layers of cotton wool, sounds die away so rapidly that it is difficult to detect any prolongation at all.

In the reverberation room, speech is confused, as the words run into one another : in the lagged room, the words are not prolonged but conversation and music become lifeless and characterless. It is evident there is a happy mean, and it was such considerations that led Sabine, then Professor of Physics at Harvard University, to investigate the whole question in 1900. He succeeded in elucidating the major principles of reverberation and deduced a formula which has since been widely used by acoustical engineers. This formula was confirmed mathematically by Jaeger in 1911, by means of a statistical method which postulated a completely random distribution of sound in a hall and a regular absorption by all the boundaries

It would be anticipated therefore that Sabine's formula would be satisfactorily obeyed by feebly absorbent rooms, but experience, while bearing this out, has also shown that for rooms containing appreciable absorbent the formula requires modification. Schuster and Waetzmann in 1929, Eyring in 1930 and Millington in 1932 derived formulæ of wider application.

Eyring's formula takes no account of echoes, resonances or air absorption and assumes a uniform absorption coefficient throughout the boundaries. The formula is, however, found to be in good agreement with the experimental results for most

Fig 9—Reverberation Room at the National Physical Laboratory for Measuring Acoustical Absorption Coefficients of Materials Volume about 10,000 c. feet. Painted Cement Surfaces, totalling about 3,000 sq feet. (*From the Report of the National Physical Laboratory,* 1934 *By courtesy of H.M Stationery Office*)

halls of ordinary shape, and it is now largely used for reverberation calculations. Eyring's formula, as modified by Knudsen for air absorption, is

$$T = \frac{0{\cdot}05V}{-S \log_e(1 - \alpha) + 4\,m\,V}$$

where T is the reverberation period of a hall, *i.e.*, the time required for the intensity of a sound to decay a millionfold or 60 decibels ;

V is the volume of the hall in cubic feet ;

S is the total area in square feet of the bounding surfaces of the hall ;

α is the mean absorption cofficient of the bounding surfaces, *i.e.*, $\alpha = \Sigma\, \alpha_1 s_1/S$, where s_1 is the area of each material constituting the boundary surface, and α_1 is its absorption coefficient, that is, the fraction of the incident energy which is absorbed by the material ;

m is the air-absorption coefficient. A correction for atmospheric absorption is necessary in the case of frequencies above about 2,000 cycles.

It will be noted that if a hall is only slightly absorptive, α is small, so that, ignoring air-absorption, Eyring's formula reduces to

$$T = \frac{0{\cdot}05V}{\alpha S}$$

which is identical with Sabine's original formula. If, however, a hall has completely absorptive boundaries, so that $\alpha = 1$, Eyring's formula evaluates T correctly as zero, whereas Sabine's formula clearly breaks down. For intermediate values of α, the values of T calculated by Sabine's formula are larger than by Eyring's formula.*

As most materials have different absorption coefficients for different frequencies, the reverberation period of a hall also varies with the frequency. It has become customary to refer to the value at 500 cycles as "the reverberation period," but, for good hearing, the values at higher and lower frequencies are also important. In Knudsen's opinion, for good-quality acoustics, whether for speech or music, the reverberation period of a hall at 125 cycles per sec. should be about twice that at 500 cycles, and should be nearly constant from 500 cycles up to say 4,000. Such characteristics approximate, it may be remarked, to those of halls in which the audience constitutes the main absorbent.

It will be appreciated that the reverberation formula is equally useful for measuring absorption coefficients. At the National Physical Laboratory, measurements are made using Eyring's formula, over a range of frequencies from 125 to 8,000 cycles.

* If α is the mean absorption coefficient, the reverberation period calculated by the Sabine formula (T_s) is greater than that by the Eyring formula (T_e) as follows :—

α	0·05	0·10	0·20	0·30	0·40
$(T_s - T_e)/T_s$	2%	5%	12%	19%	28%

The practical significance to the architect of the reverberation period is its use as a criterion of satisfactory acoustics. For small rooms where the speech energy is adequate, Knudsen has established by articulation tests the decisive advantage of very short reverberation periods. The same would apply to equally reverberant larger halls, were not the average intensity detrimentally reduced by the necessary increase of absorbent, so that from the contending factors of reverberation and loudness there is an optimum period of reverberation for good speech recognition in a particular size of hall. The larger the hall, the more reverberation is tolerated, the optimum period for 500 cycles ranging from about $\frac{3}{4}$ second for small halls to about $1\frac{1}{4}$ second for very large halls. These figures, which are based on Eyring's formula, are rather larger if Sabine's formula is used. With very large halls the

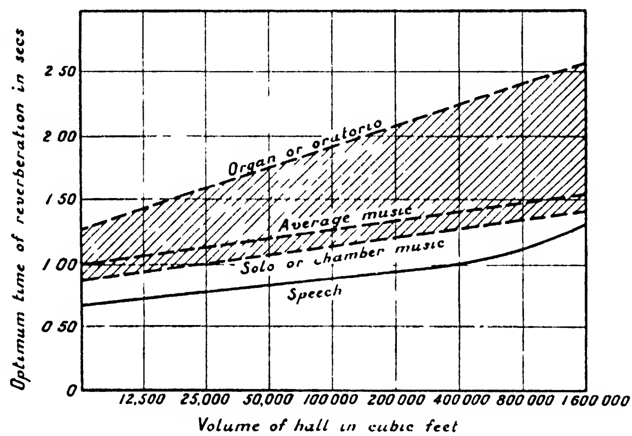

FIG. 10.—SHOWING OPTIMUM REVERBERATION PERIODS FOR SPEECH AND MUSIC IN HALLS OF VARIOUS SIZES. FREQUENCY 500 CYCLES PER SEC.

speech energy is almost always inadequate, no matter what the degree of reverberation, so that, as already mentioned, amplifiers become essential.

Musical requirements are more generous than those of speech, both performers and listeners demanding greater reverberation. A general study of musical requirements by Sabine, Lifschitz and Watson, as revised by Knudsen, leads to the view that the reverberation period at 500 cycles should range from about 1 second for small halls to $1\frac{1}{2}$ seconds or more for very large halls. Tradition may require longer periods, up to 2 seconds or more, for certain organ music, oratorios or the like. There is in fact a range of optimum periods for the same hall, the choice depending on the type of music, and, to some extent, on tradition and personal taste. Experience shows that from a loudness standpoint, certain sizes of hall provide the most favourable conditions for a specified number of singers or instruments, though there is much latitude if the reverberation is right. Fig. 10, taken from Knudsen's "*Architectural Acoustics*" connects the various optimum reverberation periods at 500 cycles with the size of the hall.

As is well known, many halls with excessive reverberation greatly improve when there is a large audience, by reason of the absorptive properties of their clothes. It is much better, however, to be independent of such a variable factor and to provide heavily upholstered chairs which will be almost as effective acoustically as their occupants, for each of whom a total absorption of about 4 sabins (*i.e.*, foot sec. units) is commonly assumed. A heavy carpet all over the floor is also very helpful in most halls.

There is a large range of acoustic absorbents now commercially available for the treatment of walls and ceilings of halls. Good absorbents are characterised by the presence of innumerable small pores or crevices in the surface. Certain absorbents such as acoustic (aerated) plasters and tiles have a masonry finish, while soft materials such as felt, asbestos, etc., are often mounted behind a perforated or porous covering.

A number of representative measurements by the National Physical Laboratory are given in Table II. As will be seen, certain materials have values as high as 80 and 90 per cent. for high notes. Most materials absorb high notes more effectively than low notes. The acoustic advantages of a felt underlay to a carpet are apparent. It should be noted, however, that the coefficient of absorption of many materials is scarcely a physical constant as, apart from its variation with frequency, it may be appreciably influenced by the size, thickness, method of mounting and distribution. At the National Physical Laboratory, measurements are carried out in a reverberation chamber on single specimens 10 feet by 10 feet in area, the conditions of test being specified as rigidly as possible.

Passing reference should be made to the important part that resonances sometimes play in the acoustics of a hall, though the practical information is meagre. Not only the hall itself but the walls and many of its contents may resonate to the sounds made in the hall. Experienced public speakers in an unfamiliar hall search for and adapt their voices to the natural resonance. The effect, which is very familiar in empty rooms such as bathrooms, may be a nuisance on occasion. Certain structures, however, such as a wooden platform or wood panelling, have a practical range of forced as well as free vibrations so that between them resonance may be excited by a considerable proportion of the music and speech range of frequencies. From a resonance point of view, it is not easy to explain the undoubted preference of musicians for wood-panelled halls, but the explanation may rather lie in the fact that, in contradistinction to most available acoustic absorbents, wood panelling (as well as lath and plaster) shows relatively low absorption for high notes and relatively high absorption for low notes. Thus music sounds brilliant instead of dead, and the quality is enhanced rather than dimmed.

Hall of the Royal Society of Arts

I may perhaps conclude with a few words about the hall in which we are to-night. The volume is approximately 48,000 c. feet (40 feet by 40 feet by 30 feet high), and the interior surface about 8,000 sq. feet, of which about 2,000 sq. feet of the upper

TABLE II

Average materials (size of specimen 10 *feet by* 10 *feet)*	*Approximate absorption coefficients* — *cycles per second* 250	500	1,000–2,000
	%	%	%
Wall and ceiling coverings			
Hard plaster	1–2	1–2	2–3
Lime plaster, smooth, on laths	2–3	2–3	3–4
Acoustic plaster (½ inch to 1 inch thick) on stone	15	25	30
Plain fibre boards ½ inch thick on battens	30–40	30–35	25–35
Leather on ¼ inch felt on battens	35	40	25
Acoustic tiles on battens — Medium efficiency	40	40	50
Acoustic tiles on battens — High efficiency	50	80	80
Acoustic felts on battens — ½ inch thick	25	45	70
Acoustic felts on battens — 1 to 2 inches thick	50	70	75
Sprayed asbestos 1 inch thick	50	75	75
High efficiency materials with perforated surfaces or covers	40	80	80
Slag wool (1 inch to 3 inches thick) on battens 1 to 2 inches thick	70	85	90
Glass silk (1 inch to 3 inches thick) on battens 1 to 2 inches thick	70	85	90
Floor coverings			
Cork carpet ¼ inch thick	3	7	20
Porous rubber sheet ¼ inch thick	5	5	20
Felt underlay ¼ inch thick	7	15	40
Axminster carpet ¼ inch thick	5	10	35
,, ,, with ¼ inch rubber underlay	5	20	45
,, ,, ,, ¼ inch felt underlay	15	40	65
Turkey carpet ½ inch thick	10	25	60
,, ,, with ½ inch felt underlay	30	50	65
,, ,, ,, 1 inch ,,	50	60	70

walls are occupied by canvas paintings below which are about 2,500 square feet of wood panelling. The seats contribute about one-quarter and the paintings about 40 per cent. of the total absorption of about 1,500 sabins, which is increased to about 2,000 sabins with a full audience of about 200. On the Eyring formula, the calculated reverberation period at 500 cycles is about 1·5 sec. when the hall is empty, and about 1·0 sec. with a full audience. (The corresponding figures on the Sabine formula are 1·6 and 1·2.) The acoustics are therefore good, but would be even better with a little more absorbent, for example, a thick carpet over all the floor, or absorbent on the remote half of the ceiling. It is fortunate that

the ceiling and dome are no higher, for echoes might then have been just detectable. As it is, the canvas paintings undoubtedly help to suppress multiple reflections.

[I would like to express my grateful acknowledgments to Dr. Constable and Mr. Berry for their assistance with the demonstrations.]

DISCUSSION

The Chairman, in opening the discussion, inquired what was the difference between reverberation and echo ?

The Lecturer replied :—Echo is due to the lag of a reflected ray behind the direct ray, while reverberation is due to multiple reflection at the boundaries of a room. It produces a drawn-out effect rather than a specific duplication.

The following questions were then put by various members of the audience and answered by the lecturer :—

Q. Are there any non-inflammable absorbents ?

A. Yes. There are quite a number of acoustic absorbents which are not inflammable, such as acoustic plasters and tiles, slag wool, glass silk and asbestos.

Q. I should like to know whether any experiments have been made with regard to temperature ? If a hall is badly heated, say, would it affect the acoustics ?

A. I do not think the temperature effect would be significant. It might alter what is called " the interference pattern," but does not play a conspicuous part in the acoustics of a hall.

Q. Would it make any difference to the sound of fans if the ventilation ducts were increased in size ?

A. If ducts are wide they should be split up, as it were, by grids to increase the proportion of surface to length.

Q. What sort of length of path of absorbent channel would be necessary to keep out loud street noises in ventilating buildings ?

A. It depends on many factors ; how quiet you want to get the hall, and how noisy it is outside. You are not likely, I think, to get a reduction factor of much more than a decibel per foot run of duct. If it were very noisy outside, a duct 40 or 50 feet long might be required for a reasonably absorbent hall. Of course, a better plan is not to have the intake in a noisy street, but to utilise some quiet region such as a courtyard or the roof.

Q. I have heard the opinion expressed that an absorbent used for reducing reverberation loses its quality in time through the pores getting choked with dust. Is there any answer or remedy for that ? Another point : What is the explanation why sound comes through two pieces of glass more readily than through one under certain conditions ?

A. I think it is quite likely that some absorbents do lose their qualities by such means, because the effect is bound up with the nature of the surface. The absorbent will suffer if it becomes choked or clogged. Certain absorbents covered with fabric permit of redistempering or repainting, but you can recover practically all the original value of the absorbent by reperforating the surface by pin pricking.

As regards the double window effect, Dr. Constable will tell you, I think, that it is simply a question of air coupling.

Dr. J. E. R. Constable :—The point is that the two sheets of a double window,

coupled by the air in the interspace, form a resonant system, the frequency of which depends upon the spacing. If the frequency of the sound incident upon the window approximates to this resonance frequency, more sound is transmitted than would be by one sheet alone.

Q. Would that be entirely avoidable if the panes of the inner window were half the size each way ?

A. No. Dissimilar windows would not avoid this type of resonance, though they are advisable on other grounds. The deleterious effect of this resonance is best avoided by proportioning the window so that the resonance frequency lies outside the frequency range of the noise which is to be excluded.

Q. With regard to the lecturer's statement about the absorption of sound by the air. He stated that the interaction of oxygen and water vapour produced the absorption effect, whereas inter-action with the nitrogen would not produce that effect. I wonder if he could give a simple explanation of that ? Also a question about loudness. I am not clear how loudnesses can be compared at different frequencies. The lecturer stated that in a room which was perfectly sound-lagged a conversation sounded lifeless. Why should that be any different from speaking in the open air.

A. I must refer the speaker to Dr. Knudsen's paper, published about two years ago, on the air absorption of high-pitched notes. It is a somewhat complicated effect, and one on which I cannot embark this evening. As regards loudness, I think the speaker should realise that it is not a question of measuring loudness instrumentally. Loudness is assessed entirely by the ear, and the one basis that has made the measurement of loudness possible is, as is generally conceded, that the average observer can match equality of loudnesses of different sounds by ear, even if they have not the same pitch. The question of lifeless speech in a lagged room is bound up with the condition that there is no reflection, particularly of the higher frequencies.

On the motion of the Chairman, a hearty vote of thanks was accorded to the lecturer, and the meeting terminated.

NOTES ON BOOKS

British Standard Glossary of Acoustical Terms and Definitions

The subject of acoustics is becoming increasingly important to modern living and presents two aspects—first, the need to plan against noise of all sorts, and, second, the problems connected with the good reception of speech and music in public and other buildings.

The first step in any science is to determine a common language in which its ideas may be expressed, and the science of acoustics is young enough to set its house in order in this respect before too many indefinite terms have become crystallised and therefore difficult to alter. In 1933 the Royal Society decided that a Glossary of Acoustical Terms and Definitions had become a necessity, and asked the British Standards Institution to set up an appropriate committee. Consequently a committee of experts, under the Chairmanship of Dr. G. W. C. Kaye, of the National Physical Laboratory, was formed in May, 1933, the result of whose work has been the issue this month of a British Standard Glossary of Acoustical Terms and Definitions (No. 661–1936). Close touch has been kept with similar work which is being done in the United States

and Germany, as well as with the work of the International Consultative Committee on Telephony.

The success of the campaign against undesirable noise is bound up with the provision of methods of measurement and fundamental units and standards, and these needs have largely been met by the publication of this Glossary. An interesting distinction is made for the first time between intensity and loudness measurements, the decibel being restricted to the former and the latter now being expressed in a new unit, the "Phon (B.S.)." Thus will be avoided the confusion in terminology which has sometimes existed in the past between these two conceptions. The proposals of the Glossary in these respects have, we understand, already been adopted by a number of official and industrial bodies, including Committees of the Ministry of Transport, the Ministry of Health and the Air Ministry, the National Physical Laboratory and the Post Office Research Station.

Taking the second aspect referred to above, the architect and acoustical engineer will now be aided by the Section dealing with musical terms and the attempts which have been made to interpret such terms on a sound physical basis.

The British Standards Institution Committee is continuing to give the whole problem close study and hopes presently to report in greater detail on the development of standard methods of measurement of sound and noise.

Copies of the book may be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, London, S.W.1, price 3*s*. 8*d*. post free.

THE YEAR'S ART. Edited by A. C. R. Carter. London: Hutchinson & Co., Ltd. 21*s*.

This annual has taken rank with Whittaker as a good bed book. It is both useful and interesting. The facts and figures it offers constitute a record not to be found elsewhere, and it includes a number of well-chosen illustrations. Mr. Carter is adept at thinking of notes relating to matters of art which, though of historic interest, are often left to look after themselves. This year, for instance, we get the exact circumstances attendant on Mr. Sickert's resignation from the Royal Academy.

In the past year the State aid to art in the United Kingdom amounted to less than a million and a half pounds sterling. A battleship costs more; one cannot help looking forward to the day when Apollo shall have turned the tables on Mars. Among private benefactions the legacy to the National Art Collections Fund of £40,000 from Miss Knapping stands out.

Chinese art has been, and is, much with us; of the illustrations one shows the Han jade horse's head from the Eumorfopoulos Collection, now acquired by the nation, and a second, the Watering Horses by Moonlight, a picture in the same collection. Obituary notices include the names of Basil Champneys, who died at the ripe age of 92; Max Liebermann, who was nearly as old; and the French painter Signac.

THE ENGLISH AT HOME. By Bill Brandt. London: B. T. Batsford, Ltd. 5*s*.

Mr. Brandt's sixty-three photographs are introduced by five pages of text by Mr. Raymond Mortimer—pleasure in whose brilliant way of putting things must not be made an excuse for neglecting the wisdom of what he says. "I believe," he soberly concludes, "that decent housing and proper food and reasonable leisure can be found for everyone in this country, without destroying the pleasant traditions and individual liberties which so many of these photographs illustrate."

Mr. Brandt in his turn has been clever in showing the lights and shadows of our national life in their natural juxtaposition. Goodness knows, the Kensington children on page 58 may owe more than a little to the East End children opposite, as Belgrave Square is in the debt of Bolton and Burslem.

Congratulations to the photographer for finding such a demure little girl with ringlets as the one on page 40. His eye for types is excellent. His publicans, flower sellers and undergraduates are just the thing. He has also discovered the pictorial possibilities of Harrow School, which occurs in more photographs than the ones where it is mentioned in the caption.

This is a book for export as well as home consumption. It answers the question : " The English : are they human ? " in the affirmative.

SUMMER EXHIBITION OF THE ROYAL ACADEMY

The appearance of the world changes, and the general aspect of pictorial art changes too, but it is hard to see what the connexion is between these movements. Industrially, we have not yet reached the peak of mechanisation ; in art we seem to have passed it. The faces that look down on us from the walls of Burlington House are softer, more human again than they were a few years ago. There are no coloured super-photographs. Some of the sculptures are rather literal and banal, but there is one portrait bust (with arms) that would lend importance to the whole exhibition if all the rest was poor stuff, which it is not—the " Margaret Rawlings " by Frank Dobson. This gracious, lively and beautiful figure of a lady leaning on her crossed arms is coloured a bright blue-green, so no one passing through the lecture room is likely to miss it. And no one should fail to see that one of the characteristics of a work of art is an aura depending directly on the pleasure the artist took in making it. To say the least, a fair number of the pictures and statues at Burlington House (and anywhere else) look as if duty rather than pleasure had inspired their authors.

A small nature picture painted with the spontaneity that must always be valuable and agreeable when ably expressed, as it is here, is 625, by Abani Roy. Naturalism is not in the ascendant again yet. Modern classicism, or striving after form, is, on the other hand, very much with us, but the patterns achieved are not regularly worth the sacrifice of geniality. Colour we get in plenty, much of it pure colour. The gloomy monochromes of the 'nineties have no descendants left now. The post-pre-Raphaelites of the school of the late Sir Frank Dicksee are nowhere to be seen. Contemporary mannerists favour an altogether matter surface ; they paint, in pale colours, nude figures standing in languid attitudes before a drop-scene of poplars and blue sky. A more profitable stylisation is the romantic and old-fashioned landscape of Mr. Oliver Hall ; so is the Rex Whistlerish picture of a Siamese cat by T. L. B. Huskinson (No. 752)—less old master than Mr. Hall, though more *pastiche*. Mr. Hall's work is attractive—however much one may feel it calls for criticism, as setting a dangerous example.

The example set by Mr. Augustus John in the department of portraiture might with advantage be followed by several portrait painters whose works lack what Mr. John's so eminently possesses—that is, definition. These arrest the eye by the clear and intelligent emphasis placed evidently where emphasis is required. In this way a head by Mr. John is distinguished from decoration on the one side and passport photographs on the other ; his heads make easel pictures. Mr. Neville Lewis, a virile portraitist, maintains a certain woolliness of texture throughout his pictures for the sake, no doubt, of an æsthetic unity. The result is pleasing,

but Velasquez and Rubens and our own Hogarth proved that the lifelike representation of flesh need not throw a picture out. Fellows of the Society will be interested to find in Gallery III an admirable portrait by Mr. T. C. Dugdale of Mr. G. K. Menzies, late Secretary of the Society.

There is a fair sprinkling of good still lifes to be seen, among others Miss Lilian Lancaster's " Flowers and Fruit " (No. 110). The tendency is rather to crowd the canvas—Renoir always knew how to serve up a basket of fruit without doing this. But post-impressionist influence is not in evidence, except, curiously enough, in Dame Laura Knight's pleasing " Rain at Ascot," which suggests Manet.

Taken as a whole, it is a good Academy ; there is performance, and there is promise. The exhibits in the architectural section share in the contemporaneousness of the majority of pictures and sculptures.

P. B.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, MAY 18..Geographical Society, Royal, Exhibition Road, S.W. 8.30 p.m. Dr. N. A. Mackintosh, **"The Third Commission of R.R.S. Discovery II."**

Industrial Psychology, National Institute of, at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 5.30 p.m. Dr. T. Bedford, **"Modern Principles of Ventilation and Heating."** (Lecture II.)

Victoria Institute, at the Central Hall, S.W. 5 p.m. Sir A. Fleming, **"Some Philosophical Conceptions of Modern Physical Science and their Relation to Religious Thought."**

University of London, at London School of Economics, Houghton Street, W.C. 5 p.m. Prof. Dr. M. Bonn, **"The International Significance of the Colonial Problem. Lecture III--Territorial Rearrangements."**

At King's College, Strand, W.C. 5.30 p.m. Dr. M. Bonn, **"Solved and Unsolved Problems of Mathematical Physics. Lecture I Relativity and Quantum Theory."**

At University College, Gower Street, W.C. 5.30 p.m. Dr. G. Bersu, **"Prehistoric and Roman Fortifications in Germany. Lecture II—Roman Limes in Germany."**

At University College Hospital Medical School, University Street, W.C. 5.30 p.m. Dr. H M. Traquair, **"Perimetry."** (Lecture I.)

TUESDAY, MAY 19..Anthropological Institute, Royal, 52 Upper Bedford Place, W.C. 8.30 p.m. Prof. C. D. Forde, **"Land and Labour on the Cross River."**

Eugenics Society, at the Royal Society, Burlington House, W. 5.15 p.m. Lord Horder, **"Eugenics as I see it."**

Statistical Society, Royal, at the Royal Society of Arts. 5.15 p.m. Sir J. Stamp, **"The Influence of the Price Levels on the Higher Incomes."**

University of London, at King's College, Strand, W.C. 5.30 p.m. Dr. M. Bonn, **"Solved and Unsolved Problems of Mathematical Physics. Lecture II—Field and Matter."**

5.30 p.m. H. Wickham Steed, **"The Control of Central Europe ; A Historical Survey."** (Lecture III.)

At University College, Gower Street, W.C. 5.15 p.m. Prof. Y. Hirn, **"Art and Aesthetic Contemplation."** (Lecture I.)

5.30 p.m. Prof. E. Cassirer, **"Leibnitz and Newton : A Comparative Study of the Method of Science and Metaphysics."** (Lecture I.)

5.30 p.m. Prof. Dr. C. J. Sisson, **"Sir Thomas More and his Circle : Some new facts. Lecture III—A Miscellany, concerning William Rastell and others of the Circle."**

At University College Hospital Medical School, University Street, W.C. 5.30 p.m. Dr. H. M. Traquair, **"Perimetry."** (Lecture II.)

WEDNESDAY, MAY 20..Central Asian Society, Royal, at the Royal Society, Burlington House, W. 5 p.m. Rosita Forbes, **"The Afghan Road to Samarkand."**

Diesel Engine Users Association, at Caxton Hall, S.W. 5 p.m. A. F. Sanders, **"Diesel Engine Combustion Research."**

Mechanical Engineers, Institution of, at University College, **Nottingham.** 5.30 p.m. C. H. Jessop, **"The Mechanization of Industry."**

Meteorological Society, Royal, 49 Cromwell Road, S.W. 5 p.m. (1) E. A. Cornish, **"On the ..lar Variation of the Rainfall at Adelaide, S. Australia."** (2) R. T. Zoch, **"On the Frequency Distribution of Rainfall at the Liverpool Observatory."** (3) Dr. T. E. W. Schumann, **"Interpolation of Monthly Rainfall Data."**

Microscopical Society, Royal, B.M.A. House, Tavistock Square, W.C. 5.30 p.m. (1) A. G. Lowndes, **"The Twin Polygraphic and Strobographic Process and its Applications to Biology."** (2) H. J. Taffs, **"The Preparation of Tin and Tin Alloys for Microscopic Examination."**

University of London, at King's College, Strand, W.C. 5.30 p.m. Dr. M. Bonn. **"Solved and Unsolved Problems of Mathematical Physics. Lecture III—Corpuscle and Wave."**

THURSDAY, MAY 21..Imperial Institute, South Kensington, S.W. 2.30 p.m. F. Young, **"East Africa."**

University of London, at University College, Gower Street, W.C. 5.30 p.m. Prof. Dr. A. Adler, **"Some Recent Developments in Individual Psychology."**

5.30 p.m. Dr. G. Bersu, **"Prehistoric and Roman Fortifications in Germany. Lecture III—Late Roman Fortifications in Germany."**

5.30 p.m. Prof. E. Cassirer, **"Leibnitz and Newton : A Comparative Study of the Method of Science and Metaphysics."** (Lecture II.)

5.30 p.m. Admiral Sir B. Domvile, **"Naval Strategy. Lecture III—Combined Operations."**

FRIDAY, MAY 22..Royal Institution, 21 Albermarle Street W. 9 p.m. Prof. E. N. da C. Andrade, **"Whirlpools and Vortices."**

University of London, at King's College, Strand, W.C. 5.30 p.m. Prof. Dr. D. Saurat, **"La Littérature Française du XXe Siècle."** (Lecture II.) (In French.)

At University College, Gower Street, W.C. 5.15 p.m. Prof. Y. Hirn, **"Art and Aesthetic Contemplation."** (Lecture II.)

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MEETINGS OF THE SOCIETY

NEXT WEEK

TUESDAY, MAY 26TH, at 4.30 p.m. (Dominions and Colonies Section). J. W. MUNRO, M.A., D.Sc., Professor of Zoology and Applied Entomology in the University of London, " Insect Damage to Empire Products " (illustrated by lantern slides). SIR DAVID CHADWICK, C.S.I., C.I.E., Secretary, Imperial Economic Committee and Imperial Agricultural Bureaux, will preside.

Tea and coffee will be served in the library from 4 p.m.

WEDNESDAY, MAY 27TH, at 8 p.m. (Ordinary Meeting). MRS. HERBERT RICHARDSON, B.A., F.R.Hist.S., " Early Commercial Advertising in England (from the fifteenth to the nineteenth century) " (illustrated by lantern slides). TOM PURVIS will preside.

COUNCIL

A meeting of the Council was held on April 11th. Present :—Colonel Sir Henry McMahon, G.C.M.G., G.C.V.O., in the Chair ; Lord Amulree, P.C., G.B.E., K.C. ; Mr. Fred H. Andrews, O.B.E. ; Sir Charles H. Armstrong ; Lord Askwith, K.C.B., K.C., D.C.L. ; Viscount Bledisloe, P.C., G.C.M.G., K.B.E. ; Sir Felix Brunner, Bt. ; Sir Atul C. Chatterjee, G.C.I.E., K.C.S.I. ; Sir William Henry Davison, K.B.E., D.L., M.P. ; Sir Edward A. Gait, K.C.S.I., C.I.E. ; Sir Reginald Glancy, K.C.S.I., K.C.I.E. ; Mr. Ernest W. Goodale, M.C. ; Sir Robert A. Hadfield, Bt., D.Sc., F.R.S. ; Mr. Charles Geoffrey Holme, M.B.E. ; Mr. Basil Ionides ; Sir Herbert Jackson, K.B.E., F.R.S. ; Major Sir Humphrey Leggett, R.E., D.S.O. ; Sir Reginald A. Mant, K.C.S.I., K.C.I.E. ; Mr. G. K. Menzies, C.B.E. ; Mr. John A. Milne, C.B.E. ; Mr. Oswald P. Milne, F.R.I.B.A. ; Mr. Tom Purvis ; Sir Richard Redmayne, K.C.B. ; Mr. Carmichael Thomas, and Brigadier Sir Edward A. Tandy, with Mr. W. Perry (Secretary), and Mr. K. W. Luckhurst (Assistant Secretary).

The following candidates were duly elected Fellows of the Society :—

Abdue, Kamille Buhary, Johore, Malaya.
Aga Khan, The Right Hon. Aga Sultan Sir Mahomed Shah, P.C., G.C.S.I., G.C.I.E., G.C.V.O., Paris, France.
Aitchison, Henry Maynard, Hucknall, Notts.

Ballard, Gilbert Alfred, O.B.E., Purley, Surrey.
Bancroft, Miss Helen Holme, M.A., D.Sc., Oxford.
Banerji, C. Deb, Allahabad, India.
Barker, Professor Aldred Farrer, M.Sc., Shanghai, China.
Benskin, Lieut.-Colonel Joseph, D.S.O., O.B.E., Frant, Sussex.
Benton, George Kenyon, Hothfield, Kent.
Berry, Edgar, Buenos Aires, Argentine.
Bligh, Stanley Price Morgan, Builth Wells, Breconshire.

Cable, Boyd, London.
Calder, Peter Ritchie, London.
Carruthers, Colin, Singapore, Straits Settlements.
Chate, Raymond Victor, Kew, Surrey.
Clarke, Stephen Henry, Middlesbrough, Yorks.
Cook, Ernest Walter, London.
Coull, William James Campbell, Colombo, Ceylon.

Darbyshire, Thomas Schofield, London.
Davenport, Frank, Hitchin, Herts.
de Karateeff, Dimitry Reginald, D.Sc., Ph.D., Oroya, Peru, South America.
Dickerson, Roy E., Havana, Cuba.
Douch, William, B.Sc., Taunggyi, S. Shan States, Burma.
Douglas, Vice-Admiral Sir Percy, K.C.B., C.M.G., London.

Forster, William Deans, Ponteland, Northumberland.

Graham, The Very Rev. John Anderson, C.I.E., M.A., D.D., Kalimpong, India.

Hanna, Dr. John R., Jersey, Channel Islands.
Harrison, Colonel Eustace James, Dulverton, Somerset.
Hawkins, Horace Arthur, B. ès L., Hurstpierpoint, Sussex.
Hill, Donald Robert, Nuneaton, Warwickshire.
Holt, Sir Richard Durning, Bt., Liverpool.

Jackson, T. E., O.B.E., Johannesburg, South Africa.
Johnson, Jabez James Arthur, Quilon, India.
Jones, Henry Edwin, Bombay, India.

Lang, Craig Seltar, Mus.Doc., Horsham, Sussex.
Lilius, Aleko Eugene, Johannesburg, South Africa.
Loweth, Sidney Harold, Bearsted, Kent.

Mais, Stuart Petre Brodie, M.A., Shoreham-by-Sea, Sussex.
Morris, Miss Ethel Remfry, M.Sc., M.B., B.S., London.

Rao Sahib, Colattur Ranganatha, London.
Reinhart, Georg, Winterthur, Switzerland.
Ross, William Baird, Mus.Doc., Edinburgh.
Rudolf, M. E., London.

Segal, Louis, M.A., Ph.D., London.
Sekido, Kunisuke, Tokyo, Japan.
Simpson, Francis Frederick Le Souef, Barnt Green, Birmingham.

Snelgrove, Professor Gordon W., London.
Stephenson, Arthur, London.
Wilson, John Charles, Manchester.
Wilson, Percival Ward, Lakewood, Ohio, U.S.A.

Final consideration was given to the award of the Society's Albert Medal for 1936, and a name selected for submission to H.R.H. the President.

The preparation of the balloting list for the new Council was completed.

The number of entries for the April and May examinations was reported, the total of both examinations combined shewing an increase of approximately 6,500 as compared with the corresponding figure for 1935.

A quantity of financial and formal business was transacted.

PROCEEDINGS OF THE SOCIETY

EIGHTEENTH ORDINARY MEETING

WEDNESDAY, APRIL 1ST, 1936

SIR PERCY E. BATES, Bt., G.B.E.

Chairman, Cunard White Star, Ltd., in the Chair

THE CHAIRMAN, in introducing the lecturer, said : Mr. de La Valette, born in the East, has spent the greater part of his life actively engaged in the commercial business of shipping. For over twenty years he was engaged directly in that business. Since that time he has kept up a large measure of travel in various parts of the world, although he has moved on to other pursuits and will perhaps be best known to you as Honorary Organising Secretary of the Exhibition of British Art in Industry, which was held at the Royal Academy last year. These two things—his shipping career and the fact that he held the important position of Organising Secretary to that exhibition—will, I think, show you that he approaches his subject not only with the knowledge to deal with it, but also from what I may venture to call the most serviceable angle, the ship herself.

The following paper was then read :—

THE FITMENT AND DECORATION OF SHIPS

FROM THE "GREAT EASTERN" TO THE "QUEEN MARY."

BY JOHN DE LA VALETTE.

The scope of this paper is of necessity restricted. Within the time at my disposal I can aim at no more than sketching a brief outline of the changes in the fitment and decoration of passenger ships which have taken place during the last eighty years. The features which make some ships better sea-going vessels than others, or more comfortable to sail in, cannot here be discussed, even though they provide the essential basis on which alone the success of any passenger vessel

can be built up. All that will be attempted on this occasion is to sketch the reasons which have at different times induced shipowners to fit and decorate the passenger accommodation in their ships in various styles; to show by lantern slides what the results have looked like; and to make one or two diffident suggestions which may, it is hoped, assist towards more fruitful collaboration in the decorative work on ships in the future.

Things of the Sea and Things of the Land

There are fundamental differences between the things of the sea and the things of the land, most of them being ultimately traceable to the stern reality of the term *functional fitness* when applied to things at sea. One has but to look at a number of the latest buildings ashore, and to observe how structures of comparable proportions, intended for similar uses, restricted by the same building regulations, and based on almost identical inner construction, nevertheless manage to assume the most divergent appearances, to realise that on land, more often than not, this term is used by architects as a peg on which to hang their idiosyncrasies. At sea it is not so There, everything must not only in fact be fitted for its purpose, but ready at any moment of the day or night to stand up to the greatest strains to which it may be subjected. Any failure so to do must entail damage, and may lead to disaster. Nor does this apply only to the material things at sea; the same stern, unfailing fitness for his task must mark every person who would earn his living at sea. For every moment may bring its own searching test to men and materials—with frequently bare survival as the measuring rod applied. This explains and justifies the differences in experience, tradition and outlook between the men who live in the two elements. The fundamental problem that faces the builders and interior architects and decorators of passenger ships is that they have to find a satisfactory compromise between the requirements of the men of the sea and the predilection of passengers.

It is my first submission that no ship will ever be a satisfactory ship, even from the point of view of the landsman or landswoman who has to travel in her, unless first, last and throughout, she complies unstintingly with the requirements of the men of the sea. My next submission is that, even where the mere look of things is concerned, this will be more lastingly pleasing to the extent that it is founded upon a healthy acceptance of the elements which make a ship a good sea-ship.

Starting from these premises one's experience of ships of different nations and classes in many seas over a fairly long stretch of years leads one to suggest the following as a convenient classification of the "styles" seen in the passenger accommodation of steamers:—

1. The style of the "Foreman Joiner."
2. That of the "Grand Palace Hotel."
3. That of the "Museum Ship."
4. That of the "Exhibition Ship."
5. The "Comfort-with-Dignity" style.

These should not be looked upon as chronological " periods." They overlap in time, and are often found mingled in the same ship.

Allow me to indicate succinctly what I mean by these terms.

The style of " the Foreman Joiner " developed from the fact that all the fitting and decoration of ships was at first carried out by the shipbuilders and consequently devolved upon their foreman joiner. The result was invariably suitable, thoroughly solid work. But when it came to working out a " high-class job," the tendency to " put a little more art " into it, usually meant adding extraneous ornament or using materials because they were expensive, often with garish results, albeit in the taste of the day.

In due course this no longer satisfied the travelling public. The Grand Palace Hotels that were springing up in all big cities set a different standard which came to be followed at sea. It led to the introduction of pseudo-period rooms, most of them from their normal proportions and dimensions utterly unsuited to the accommodation available in even the biggest ships of the time.

As more lavish decoration became general, it began to pall. Then the ship decorators discovered that public interest was still roused by producing not approximations to period styles, but exact replicas of famous halls or their decorative details in much the same way as houses were being built and furnished in America. That led to the study of museum specimens and their reproduction on board. In due course the gloriously middle-class glamour of the Cinema Palace de Grand Luxe effectively killed public interest even in faithful replicas.

Fortunately by this time a fresh movement had grown up to provide shipowners with a new means of arousing attention for their ships. The revival of public interest in living artists, as distinct from those long dead, coupled, at any rate in certain countries, with a governmental passion for national propaganda, led to the utilisation of ships as floating publicity ; they grew into Exhibition Ships, into Show Boats.

Meanwhile another influence had been at work among shipowners, one which, from inherent personal predilections as much as from a sound consideration of their special type of *clientèle*, led them to conclude that comfort with dignity provided in the end as strong, if not stronger, an attraction to prospective travellers as the production of " stunts." The interest of this movement lies in the fact that it furnishes shipowners of different countries with a happy means of bringing their national characteristics and aptitudes into play. If it is persevered in we shall find surviving in ships that pleasant variety due to national diversity, which is becoming lost on land through the inane copying by the incompetent of one another's dreary discoveries.

I hope by this rapid survey of the changing styles in ship fitment and decoration to have shown that my classification is not arbitrary, but attempts to express a natural sequence in the development of passenger ships, based upon the changing exigencies of the travelling public.

EARLY STEAMSHIPS

The earliest steamships plied on inland waters and around the coasts. Their advantages and amenities were consequently balanced in people's minds with those of sailing hoys, horse-drawn canal craft or stage coaches, a fact which is apparent from the advertisements and the articles written at the time.

The first steamboat employed in Europe on a regular passenger service was the wooden paddle-steamer *Comet*, built on the Clyde in 1811–12 by John Wood & Co. to the order of Henry Bell. It was in his memory that the *Queen Mary* on her first passage down the Clyde on March 24th blew her deep-throated siren as we passed Bell's monument at Dunglass Castle. Although only 40 feet long with an extreme beam of 11½ feet and a burden of 25 to 30 tons, she was proudly advertised in August, 1812:

> "Steam Passage Boat, the *Comet*, between Glasgow, Greenock and Helensburgh, for Passengers only."

Her main accommodation consisted of a few wooden benches on deck, and a small cabin aft, reached by four steps down a companion way, in which were a table and side benches. There was full headroom only in the centre beneath the skylight. A primitive forecastle, reached by an iron ladder, supplied the only other shelter below deck. A payment of four shillings admitted to the after cabin, three shillings sufficing to secure the protection of the forecastle. After running her successfully in this service, Bell started the earliest of pleasure cruises, using the *Comet*, to quote his own words, as

> "a jaunting boat all over the coasts of England, Ireland, and Scotland."

Subsequently she carried on a regular service between Glasgow and Fort William in the West Highlands, eventually running ashore off Craignish Point in Argyllshire in 1820, when she became a total wreck.

Among the useful things which the *Comet* had proved was that she was too small to be a complete financial success. From then on the increase in the size of passenger ships continued persistently. The type of vessel used on the Clyde in 1817 already showed increased size and ampler, if still primitive, passenger accommodation, on which the Thames steamers running to Margate in 1819 further improved. In fact, if we compare the latter with, say, the *Crested Eagle* of the General Steam Navigation Company Limited (built in 1925), we observe that her early precursor already possessed the essentials of our present-day Thames vessels, albeit on a humble scale.

Steam power in ocean-going ships remained, until the middle of last century, very much in the nature of an auxiliary to sail. The interior arrangement of early sea-going steamships was therefore the same as that in contemporary sailing ships. What this meant is shown on a plan and section of the paddle-steamer *Brilliant*, built in 1830. The main passenger accommodation was still at the after end of the ship, a position which had normally developed in sailing ships from the fact that direct steering, and the need to oversee all the sails, had forced the captain to select his position there, while the highly built-up sterns and abundant stern windows made those

quarters the most convenient. Since the engines as well as the paddles of the early steamships were amidships or forward of it, there was no reason to alter this arrangement. Change only came when the introduction of the screw made the after-part of the ship less peaceful or pleasant than amidships, and when decks had grown in numbers, leaving engine rooms far below.

Another useful example of early cabin accommodation is provided by this plan of the *Royal Tar*, a wooden paddle-steamer of 308 tons gross, built in 1832 for the Dublin and London Steam Packet Company. In 1836 she was chartered by those two enterprising sailing shipowners, Wilcox and Anderson, for the service of the Peninsular Steam Navigation Company, which they had recently established to continue by steamships the services between England and Spain and Portugal which they had, since the Peninsular War, carried on with sailing vessels. Thus this humble little vessel became the precursor of the magnificent fleet which the Peninsular and Oriental Steam Navigation Company was in due course to spread over all the Eastern shipping routes. She was so successful that a year later she wrested the mail contract from a most conservative Postmaster-General.

It is worth noting that while the dining saloon is actually placed between the cabins, a practice which long continued, it opens out aft into a sitting accommodation built in the stern of the ship and lighted by the stern windows. Apart from the other accommodation shown on the plan, you may observe that there are two large single-berth cabins. One was available for passengers of great eminence, the other was allotted to the "Admiralty Agent," that is to say, a naval lieutenant who, being in charge of His Majesty's mails, had power to order the ship to stop, to proceed, or to call at ports, as he deemed requisite. Similar arrangements prevailed on the ships of the Peninsular and Oriental Company (as it had become) which went round the Cape to India and the East, such as the *Hindustan*, which opened this service when she sailed from Southampton on the 24th of September, 1842, the rather bigger *Bentinck* of 1843 (1,974 tons gross) and other vessels, including those which maintained the Eastern end of the route between Suez and the East. The Western end had its terminus at Alexandria, the so-called " Overland Route " linking the two.

At this point we may again observe that many of the institutions which we flatter ourselves to have invented, have had early predecessors. I have just mentioned an early tourist ship. The P. & O. vessels of the eighteen-forties were already looked upon in the light in which tourists nowadays look upon certain regular lines to the Mediterranean and other parts, namely, as convenient means to make a round tour, as distinct from a passage between two terminal points. In his " Journey from Cornhill to Cairo," Thackeray tells how in those days the performance of the " Grand Tour " seemed to have been changed from an overland voyage into one by the two lines of the P. & O. which between them covered most of that part of the classical world with which a well-bred gentleman deemed it essential to be acquainted. More interesting still, I have been assured by Colonel E. A. Ewart of the P. & O. that his Company never even paid

Thackeray for writing them up in such glowing terms. In that respect at any rate we have advanced to-day !

If the advantages of steamships in the matter of saving time were marked over both sailing ships and communication by land in those parts where railways had not yet been built, the comfort they offered was not excessive. One is not altogether surprised to find Charles Dickens grumbling a good deal about his crossing to America in the first Cunarder, the *Britannia*, in 1844, when one looks at his cabin and compares it with the glowing description by the Company of the ship's luxurious equipment. Here, indeed, is the " Foreman Joiner " at his most primitive.

But everything is relative. The days of the Empress Eugénie were certainly not lacking in luxury or opulence. Yet here are the private cabin and bathroom of Napoleon III on board one of the ships which the Cie. Générale Transatlantique advertised at the time with great flourish of trumpets. There seems little in them that would not make us prefer a third-class cabin on either the *Normandie* or the *Queen Mary* to the Imperial suite of that day.

In the journals of travellers to the East Indies by the " Overland Route " of the P. & O., one comes across references showing that there were, before the opening of the Suez Canal, generally two bathrooms on these ships, one for ladies, the other for gentlemen. They were built into the paddle boxes, thus providing ample opportunity both for splashing and singing without inconvenience to fellow-passengers. Ventilation below deck was scanty, and sleeping on deck was normally resorted to. Judging by the journals of certain Dutch divines who travelled in these ships to Singapore, that rather upset the attempts made on board to " separate the sheep from the goats " wherever possible. In the earlier ships which had no separate smoking rooms, addicts of the weed had to proceed to the forecastle head to gratify their desires.

Advent of the Modern Steamship

The decline of the clipper ship, although she continued for a considerable time thereafter to grace the seas, and the advent of the modern type of steamship may be dated from the decade between 1850 and 1860. There are several reasons for this.

First there was the introduction of iron into the hull construction of ships, at first only in so far as the frames were concerned, the skin being still of wood ; eventually by building the complete hull of metal. It was only by using iron that ships could be built exceeding about 300 feet in length, as it had been found that over this length no wooden ships could be built strong enough to resist the corresponding strains on their hulls. Thus the completion, in 1851, of the *Tubal Cain* (787 tons gross), the first composite ship, opened the way for the big passenger ship. The next step was the application to marine purposes of the compound engine in 1856. By reducing the fuel consumption per power unit to a considerable extent, it enabled vessels economically to carry enough fuel for

long journeys without the need for intermediate refuelling. The adoption of the screw propellor, at first concurrently with paddles, later, except for special purposes, almost to the exclusion of the latter, was another factor which brought the big steam-driven ship within the reach of practical possibilities. The opening of the Suez Canal, by confirming the great advantage of power ships over those dependent upon winds which the Overland Route to the East had already demonstrated, gave a strong incentive to the adoption of the steam-driven ship.

It is not often that the potentialities of new mechanical and constructional inventions are comprehensively demonstrated in the early years of their becoming available, but the years 1858–59, which saw the construction of the *Great Eastern* commenced and completed, witnessed in that ship a practical indication of all the salient features of the construction, as well as the fitment and decoration of big ships, for the next half century. The ship, which the magnificent vision of I. K. Brunel had conceived and the shipbuilding skill of John Scott Russell had created, became a failure as a passenger vessel mainly because marine engines in their day had not yet reached the degree of perfection required for so vast a vessel. Some of her features, even as a passenger ship, which set new standards are worth recalling.

With an overall length of 692 feet, extreme breadth of hull (not including the paddle boxes) of 83 feet, and a depth of 58 feet from upper deck to keel, she measured 18,914 tons and remained the biggest ship ever floated for exactly forty years. In accordance with the indications given by Brunel, who was not a shipbuilder, to John Scott Russell, who was a highly skilled one, her structure was based upon that of the tubular bridge over the Menai Straits, and the upper deck and bottom were made completely cellular. Not only had she therefore a complete double bottom over most of her length, but the separate cells went up her sides to above the waterline. She was thus the earliest example of a "ship within a ship," of which the *Queen Mary* provides the most complete demonstration.

In the hope of leaving nothing to chance, she was equipped with both paddles and screw as well as with six masts, of which the mainmast, in way of the paddle boxes, and the one forward of it were square rigged, the remaining four carrying schooner sails. Having been designed without regard to sailing ship precedents, her stem was straight and her deck flush and without sheer. The latter characteristic has since been abandoned by most ships, and to my mind rightly, as it leads not only to ugly, but to uncomfortable, seaships ; but many of you may remember that pre-war German ships had a strong tendency in the same direction. Her upper deck, which was iron-plated, ran flush and unbroken from stem to stern and measured over 20 feet on either side of the hatchways and skylights to the saloons, thus providing two wide, unencumbered promenades, over a furlong in length, and thereby anticipating the *Normandie*.

Her passenger accommodation was unprecendented, and long remained unequalled. It provided for 800 first, 2,000 second and 1,200 third-class

passengers and a crew of 400. It may be worth mentioning that the biggest ships of recent years, and the two giant liners which France and Britain have recently produced, do not exceed some 4,000 passengers in all, although their crews have grown to be more like one thousand all told.

For the passengers' convenience ample provision was made in five saloons on the upper and an equal number on the lower deck, the aggregate length of the principal apartments being 400 feet. Their equipment still belonged to the "Foreman-Joiner" period, in that it was completely adapted and subordinate to the ship's structure. On the other hand, the materials used were of the most magnificent kind, and mirrors and gilding were found everywhere in great profusion. Nevertheless, apart from such details which depend upon contemporary taste, it will be seen that the decoration of the Grand Saloon, for instance, bears proper relation to the structural features, and might well stand as an example to many later shipbuilders and decorators.

Another feature which marked the *Great Eastern* structurally, and one which impressed itself upon her interior arrangements, was the system of longitudinal framing, combined with numerous complete and partial bulkheads, adopted by Scott Russell. To this were added longitudinal bulkheads in prolongation of the sides of the engine and boiler spaces, which were carried up right to the uppermost deck. A similar feature, by the way, will be found among the most characteristic things in the *Queen Mary*. In both ships it led to certain results in the distribution of the passenger accommodation. In the *Great Eastern*, for instance, it provided the outer limits of the dining saloon, the space on both sides being devoted to cabins. In the *Queen Mary*, where the owners have elected to continue the dining saloon to the full width of the ship, it accounts for the structural features which have been retained in this vast compartment, the biggest dining hall afloat or ashore. These features, having been skilfully utilised by the interior decorators, pleasantly break up the immense space of the dining room into more circumscribed compartments which, while benefitting from the general effect of vastness, are devoid of the overpowering sense of size which might otherwise have been theirs.

Having seen the apartments allocated to the Emperor Napoleon III some ten years afterwards, it will come as no surprise to you to find the ordinary staterooms of the *Great Eastern* distinctly primitive, with six-berth cabins the rule. On the other hand, the "Family Cabin," forerunner of our Cabin-de-Luxe, presented various well-thought out features, such as curtains arranged not only to screen off the sleepers, but to enable them to undress in privacy. The furniture, too, in these cabins was of more elegant pattern and in keeping with the best practice of the day ashore, while luxurious carpets were provided.

One other feature requires mentioning. It is generally accepted that in the 'sixties the White Star Line were the first to transfer their first-class passenger accommodation from aft to amidships, and the claim holds good so far as successful, regular ocean passenger ships are concerned. But in this matter, too,

it was the *Great Eastern* which carried out the idea before it had been tried on any other ship.

Finally, she introduced a measure of separation between the third-class accommodation and the crew space, not until quite recently found in many ships, and of which the *Queen Mary* once more provides the complete example.

The failure of the *Great Eastern* as a shipping venture caused many of her good points as a passenger ship to be ignored. From the 'sixties to the late 'eighties of the last century there was a good deal of progress in hull and engine construction, but very little in either the fitment or the decoration of passenger ships. The dining room of the *Avondale Castle* retains the most primitive appearance, and the drawing room of another Union Castle liner of that period proves that though the "Foreman-Joiner" was structurally sound enough, his taste in decoration was not infallible. The "Nederland" liners of the type on which I travelled in the East Indies in the 'nineties, show the same general features, but the addition of electric light and fans marks a noteworthy improvement. I have myself travelled in those same waters in a ship where the only lights were a swinging, smelling paraffin lamp above the single dining table, and candles in lanterns, one side of which shone into the cabins and the other into the dining room. The only artificial ventilation consisted of a *punkah* brought into motion by a rope attached to the big toe of a Chinaman, whose leg swung free from the table on which he sat. Abuse and the projection of missiles were the means resorted to when failure of this ventilating power caused the heat to become too oppressive. From such simplicity to the air-conditioning and the cooled or heated ventilation of our modern ships seems a long distance to have travelled in the lifetime of one not yet feeling very old.

From *Fin-de-Siècle* to the Slump.

The *Art Nouveau* disease which grew up in the late 'nineties and was enthroned at the Paris Exhibition of 1900 had little effect on the decoration of ships. Occasionally its devastating influence was to be seen, as in the dome of the otherwise very pleasant dining room on the North German Lloyd liner *George Washington*, but it faded away before it had had time to influence ship decorators. In this country I have never come across it in ships, although that which we produced here in its stead was not, perhaps, any more satisfactory, as witnessed by the dome over the first-class saloon of the Union Castle liner *Saxon*.

The bigger ships which came into commission since the late 'nineties, the growing competition for the American traffic, and the vigorous growth of German shipping enterprise in many parts of the world, especially on the Eastern routes, introduced the stimulus of keener competition. Under its influence the "Grand Palace Hotel style" began to flourish luxuriantly. Partly for reasons of politeness, partly because too many examples must be known to you all, I will spare you slides illustrating this subject. The efforts varied from those which took the more

glamorous of our popular eating houses for their models, to those which vied with the latest hotel palaces of the world's capitals.

An off-shoot of this style was a somewhat mixed affair which reminds us of certain opulent country houses to be found in some countries on both sides of the Atlantic. The lounge of the *Winchester Castle* is a somewhat disturbing example of this, although the cabins in the same ship, having calmed down a good deal, seem more satisfactory.

An improved post-war, even post-slump, example of this style is to be found in the *Empress of Britain*. The main lounge and drawing room are hardly distinguishable from those of a sumptuous hotel, and even Mr. Edmond Dulac's Cathay Lounge seems a place on shore rather than in a ship. The hairdressing establishment provides us with a strictly modern battery of frightening apparatus, in surroundings of metal and glass, but the beauty parlour brings in the feminine touch by placing the padded surgical chair in a restful Louis XVI boudoir.

In its most perfected examples the trend from which this style of decoration arose culminated in the beautiful replicas of carefully studied models which were to be found in certain ships, among which the *Mauretania* held high place, the effect being enhanced by the graceful way in which the natural camber and sheer lines of the vessel's structure had everywhere been preserved in the decorative arrangements. The most recent, as it is also the most magnificent flowering of this style is undoubtedly the Sala Colonna in the *Conte de Savoia* of the United Italian Lines. I believe that not only many Italians of great taste, but even the management of the Line to-day have certain doubts as to the suitability of having ever built this grand hall into a ship. It may well be that when you come to see the slides of other parts of this ship, and of her sister-ship the *Rex*, you will feel it does not belong to them and that you prefer the other parts. But it is undeniably a magnificent, and also a very beautiful achievement in itself, and, to my knowledge, the supreme example of what I have called the "museum style" of ship decoration.

Rational Ship Decoration

At this point you may come to ask : "But if such beautiful effects can be obtained by copying, or adapting, the finest examples of interior decoration on land for use in ships, why should not it be done ? Provided it be done with good taste, and executed with skill, what is there against the idea ?

You may even wish to add the arguments which the Hamburg-America Line brought forward in commending their then new ship, the *Vaterland*, better known to the post-war generation as the American-owned *Leviathan*, that masterpiece of garish excess :

> "With regard to the artistic decoration of the public rooms in the first class, it should be observed that a shipping company, which must attract an international public, cannot without more ado set aside the beauty-values of the classical styles, among which must be reckoned many *motifs* from the days of the French kings, in order to introduce new kinds of

styles, so long as the latter do not yet represent a generally established taste."

Or, again, you may wish to quote the argument which we have all heard shipowners bring forward, and which has been an instruction to many ship decorators: "The ladies want to forget that they are on board a ship—make them forget it!"

There is a good deal of truth in all these observations. We must not overlook that a ship is not built to be an *objet d'art*, but to earn dividends by attracting passengers, not only those of to-day, but of all the twenty-five years to come, which represent the life-time of a modern passenger ship. This means that one cannot generalise on ship decoration in the abstract, but must consider its application to each trade by itself, and then in the light of the period during which the ship will have to run. Proved suitability is therefore of importance, and one can well understand shipowners being conservative, and adhering as long as possible to what has proved satisfactory in the past.

The question is: How far has there been a genuine change in public taste which warrants making provision for it? And what are the trends in that change which are likely to survive the next five-and-twenty years? Let us turn to practice for an indication of the answers which different shipowners are giving to this all-important question.

The P. & O. Line, at all times among the foremost to provide the nautically perfect ship, had hitherto based its decorative arrangements largely on the ascertained, or alleged, taste of stout Indian colonels and hard-working K.C.I.E.s, all devoted to their present duties—but longing only for the time when they will be settled again in their ancestral home, or the nearest replica of it they can secure. It seemed unsafe to disturb so worthy an atmosphere—and up to the *Viceroy of India*, the Company did not venture to do it. Yet a glance at the dignified, simple, first-class dining room, attractive tourist smoking room, and pleasantly up-to-date cabins-de-luxe on the new *Strathmore*, shows that there has been little short of a revolution in the interior decorations.

Another line which has hitherto catered for the strongly conservative side of British taste is the Union Castle Line. It, too, has turned a new leaf, as you may notice from comparing the agreeable first-class lounge and the card-room which overlooks it on the *Stirling Castle* with some of the earlier ships which you have just seen. It has also introduced the useful arrangement of having convertible cabins-de-luxe: sitting rooms by day, bedrooms by night.

Nor is this return to simplicity and distinction restricted to British ships. Good examples of it are furnished by the *Manhattan* and *Washington* of the United States Lines. Here it is not the effect of modernism that has been aimed at, but a homely aspect of comfort, based upon the utilisation of the structural lines of the ship. Some of the cabins in these ships present a rather unusual feature in that a third emergency berth is concealed in the upper deck of the cabins, to be lowered when required. I would also like to show you a very simple but

comfortable and cleanly designed ordinary stateroom in one of these ships, and draw your attention to the straightforward plumbing under the wash-basin. I am sorry to say that even on some vessels that have been equipped with great care and forethought the appearance of the plumbing on British ships is far too often open to severe criticism. The example which I show you herewith has been taken from a ship on which an immense amount of thought and care has in all other respects been spent, and I could add many more.

Yet here is a tourist cabin on the *Bremen* to show how simply and attractively this can be remedied. I strongly urge British shipowners and shipbuilders to establish their own plumbing school, since shore plumbers are notoriously inclined to prefer the Heath-Robinsonian solution every time. I am glad to add that my recent visit to the *Queen Mary* has shown me that in her this point has been most happily borne in mind.

The earliest examples of ship fitting strictly adapted to ship construction, and decorations based on the inherent features of both, emanated from the Nederland Line, of Amsterdam. As long ago as 1906 that Company started its association with a famous Dutch interior decorator, M. Lion Cachet, which has lasted throughout twenty years, from the *Grotius* which made her maiden trip in 1907 and has since been scrapped, to the *Johan van Oldenbarnevelt* and the *Marnix van St. Aldegonde* which were completed just before the world slump came to be felt. I cannot, unfortunately, enter into the interesting principles which guided M. Lion Cachet in his decorative features and his symbolism. In these ships, as far as I know, for the first time the stressing of national characteristics became allied with a sound appreciation of the value of a ship's structure in determining her interior equipment. The result is typically Dutch, yet such as, for that very reason, to make other nationalities feel at home in these ships.

It is interesting to observe that in this Company's *Johan de Witt* an attempt was made to decorate the stern of the ship with a sculpture of the statesman after whom she was named. The experiment was not repeated.*

For reasons which strike me as being closely akin to those existing at Amsterdam, the next place in which the endeavour to base ship decoration on a national, even local, sense of beauty was Bremen. Excellent ships have been built at Rotterdam and at Hamburg, but somehow, compared to their respective neighbours, these ports never possessed quite the same tradition of highly cultured merchant-princes, with a long training in the appreciation of beauty. The Norddeutscher Lloyd, from the early days, seems to me always to have struck a more personal note in her decorations and fitments than other German companies. Certainly the visit

* It may be of interest to state that one of the most modern of present-day sculptors in this country has been pressing the Cunard White Star management to allow him to decorate the stem and stern of the *Queen Mary*. The sculptor's request and the Company's refusal cast an interesting light upon the different notions on "functional fitness" and "functional appearance" held afloat and ashore.

I paid to the *Bremen*, some years ago, left me strongly impressed on that point; she is unmistakably a German ship, and very distinguished and comfortable in a manner which one identifies with German life.

A vista along the *Bremen's* promenade deck is an excellent example of the attractive patterns that may be produced merely by taking a little care about structural features. For you should not imagine that every ship of a somewhat similar deck construction produces the same effect. Nor need the pattern always be of the more or less rectangular type here shown. The view of the upper saloon in an early Canadian Pacific liner, the *Islander*, shows how delightfully curves can be introduced. One needs little imagination to appreciate how shipbuilder and interior decorator, working together with mutual understanding from the early stages of the designing, may succeed in producing as yet unappreciated beauties in ship decoration, without in the least straining the structural design.

Another instance of the influence of national tendencies on the appearance of ships' interiors is to be found in the two recent Italian liners, *Rex* and *Conte di Savoia*. That they should be national is not surprising, since they are admittedly propaganda ships, as well as " Show Boats." To this aim certain extravagances are due, the absence of which would in no wise harm the general result. But apart from this, there is evidence, and very delightful evidence, in these ships of inherited Italian traditions. Every Italian mansion is deliberately built around its main staircase. So are the main appartments in the *Rex*. Then, again, no Italian palace is complete without the lovely vista along seemingly endless passages into which light pours from generous windows. Of that kind is the long gallery in the first class of the *Conte di Savoia*. Bridges over Italian canals have a rare grace of curves and generally pleasing railings. So has the swimming pool on the *Rex* which might be a corner anywhere in a sunny part of Italy.

" Normandie "—A French Work of Art

The next, and to this day the most resplendent, attempt to turn ships into floating displays of a nation's artistic genius, is represented by the great French liner *Normandie*, of the Compagnie Générale Transatlantique. No one who visits her, or who even only sees pictures of her, will fail to be impressed with the beauty and sweetness of her external lines and the splendour of her interior accommodation. Architecturally and artistically she is a magnificent achievement, one worthy of the highest French traditions. In fact, she stands pre-eminently for the French outlook on much more than merely ships.

The principles which underlie her conception cannot be better outlined than in the words which M. P. de Malglaive, at present Managing Director of the Line in England, was good enough to allow me to quote from a letter he wrote me:

> " We wanted to produce, he says, a ship which would embody the most modern artistic trends and be the exact reflection of the French nation's genius; we had in mind above all cleanness of line and big architectural

> effects . . . We achieved these aims as the result of a tremendous amount of research and designing, by eliminating entirely from the decks any auxiliary machinery, and by providing divided uptakes for boiler-rooms and engine-rooms. All these researches were made in common by the architects, mainly under my own supervision, as at that time I was in charge of the Technical Department of the Compagnie Générale Transatlantique.
>
> " Needless to say, in order to meet the conflicting views of both classes of architects, much ingenuity had to be exercised, but I can assure you that the *Normandie* as a ship is inferior to no other ship in existence in the world."

From the point of looks nothing could well be more attractive than the ship's general appearance and her immense, unencumbered uppermost deck. Whether that *tour de force* will enable passengers to walk about happily on that deck during average North Atlantic weather, depends on personal predilection, like so much else in these matters.

Of the magnificent suites of gigantic halls, many of them leading into one another, the slides will give you but a faint conception. Nor is there here opportunity to go into the divergence of opinion which has existed, and, after all the research made in connection with the *Normandie* on the one hand and the *Queen Mary* on the other, still persists, between British and Continental shipbuilders on the advisability or otherwise of dividing the smoke uptakes and those from the engine-rooms, in order to obtain those big open spaces in which Frenchmen naturally feel at home, and Englishmen not so easily. On this point, again, it seems to me best that each nation should adhere to that which comes most naturally to it, trusting that if it succeeds to its own, most exigeant, satisfaction, it is most likely to attract also those travellers of other nationalities whose predilections tend its way. After all, no single ship can hope to cater for all the tastes in the world.

A British Point of View

It is possible to consider a ship and her interior arrangements also in another way. That is to look at her first, last and all the time as a ship, and to give to the shipbuilder and the marine engineer first place in one's considerations. Past experience and the results of the research tank will there be the primary concern. Within the limitations derived from the technical decisions the interior decorators will have to restrict themselves. This is an eminently British point of view.

Allied to that school of thought is the enthusiastic ship decorator, who gleefully accepts the limitations imposed upon his endeavours to produce the finest possible ship of its kind, and derives strength for the design of his accommodation and decorative scheme from the very restraint placed upon him. He is the sort of man who would every time call a ship a ship—and feel assured that if only he is sufficiently competent at his task, no female passenger will fail to be happy in his vessel.

Thus there arose the type of ship decorator who envisaged his problems afresh; who appreciated the fact that neither the dimensions nor the proportions on board ships correspond with those required for period apartments. The low-ceilinged, extended spaces between decks do not even have their counterparts in modern flat buildings. For there all walls and ceilings are flat, and meet each other at right angles. The sheer and camber lines, essential to a good ship, give an upward curve lengthways to all her decks, that is to say to the floors and ceilings of her compartments, and a downward curve to the thwartship section of her decks, and in addition to this the ship's sides are curved. The Tudor country cottage alone would provide some approximation to normal conditions in a ship!

Then, again, light on land usually comes from above. In ships it rarely does. In so far as it enters from outside at all, it is more often than not reflected upward from sea level. The "Nederland" ships to which I just referred show a perfect appreciation of this in the way the outer doors and windows of certain apartments have been partly screened so as to allow the light to play on the ceiling whilst avoiding its glare in the eyes. Then, again, the straight line hardly occurs naturally on a ship; the need for conforming to the movements of ships and waves tends towards the curved line in practically every detail. Angularity is not ship-shape—and somehow one feels it is not, as soon as one sits back and allows oneself to watch the gentle movements of the ship. Angularity accentuates their visibility; smooth curves disguise them. It is a very practical point in catering for the ladies—and others.

Even on the biggest ships halls can only pierce through two or three decks over a certain part of their total area. The sides are bound to be brought down, thus creating effects which are only found ashore in certain smallish seventeenth century churches. Pictures are not usually effective on the side walls; they strike the eye at the wrong height. Again, I have the authority of at least two ladies, both widely travelled and with a trained eye for interior decoration, for saying that colour schemes on board work out differently from what they do ashore. This is no doubt partly due to the absolute differences in the quality of the light which surrounds one at sea, whether in the open, or in artificially lit spaces. In part, however, the psychological predisposition of at least the female passengers would appear to demand a separate treatment of colour schemes in ships.

These and many other similar considerations, even apart from technical points of difference, have induced shipowners in this country to try and develop a style for their ships independent of shore architecture which, whilst being completely adjusted to their particular type of vessels, will combine absolute comfort with peaceful dignity.

A vessel, the construction and accommodation of which have been deliberately worked out on such principles is the *Orion* of the Orient Line to Australia. Curiously enough, in conversations with people who are interested in this kind of matter, she seemed to me to receive more criticism than praise. Those who have publicly lauded her interior arrangements, may have something to do with this,

for, unfortunately, they have been recruited largely from among shore architects with a predilection for one particular brand of modernism, that which bears the vintage label 1933. Having recognised something of this style in the ship, they have lauded it. Others for the same reason have been diffident.

Neither point of view seems to me in the least relevant. She is very good as a passenger ship, because one cannot help feeling that, even to those who may not like certain of her decorative details, she will, after a couple of days on board, prove to be a comfortable, unassuming ship, which does not all the time force one to be in ecstasy about either art or industry.

If she is, in my submission, not a perfect specimen of her type, it is because her architect does not make one feel that he has yet found his sea-legs at this work. The ship is still too much a replica of a shore " period " style, even though that style be " 1933 " instead of any special " Louis." The point I am alluding to is not very apparent in the first class or the tourist dining rooms, both, it seems to me, pleasant places for their purpose, but, for instance, in the Long Gallery. You will observe the needless angularity of this apartment, the sheer and camber lines which could have added grace to it, as they do to similar rooms in the *Queen Mary*, having been obliterated. This, clearly, is a survival of modern land architecture which entails too great an addiction to the T-square, and too little appreciation of graceful curves.*

Even so, one feels strongly that the architect is on the right lines, and we can only hope that the managers of the Orient Line will continue their connection with him in their next building contracts, so that their collaboration, so happily begun, may mature, as all good things mature, by further experience and exertion. The only thing one would plead for is that on future occasions the use of materials which are entirely unsuitable in ships should be avoided. I am referring to such things as the big glass panels which are now sometimes also misused on land. On board they seem even more out of place, unless one really likes to see strange animals and alleged human beings crawling over the reflection of all the rest of the room.

The " Queen Mary "—a British Masterpiece

We have now reached what is, for the present, the last word in big ships, the *Queen Mary*. Let me say at once that, to any one with a love of the sea and ships in his heart, she must appear as the supreme British achievement of the two great national industries : shipbuilding and shipping. We can have no doubt to-day that in her performance she will, as in her appearance she already does, constitute

* Since this paper was read, Mr. T. F. Tallents, of the Orient Line, has written me :—

" This observation would not, I think, have been made had you seen the ship and not merely photos of her. It is definitely untrue that in the Long Galleries the sheer and camber have been concealed. The sheer has been very carefully left intact, though it happens to be comparatively slight in that particular part of the ship."

I hope to correct my observations *in situ* next time the *Orion* is in port. Meanwhile, I am glad to have the principle I raised confirmed in this way by eminent experts.

a magnificent tribute to her owners, the Cunard White Star Limited, and to her builders Messrs. John Brown & Company, names which have long figured honourably in the history of British ships.

On this ocasion I have time only to refer in briefest outline to some of the principles underlying her interior arrangements, a rather fuller exposition of which I have attempted elsewhere.* In the sense which I outlined a moment ago, the *Queen Mary* seems to me the perfect embodiment of British views on what a passenger ship should be, both technically and decoratively. She was conceived in the right way, and her design, as well as the completion of every detail, were supervised in accordance with certain fixed general principles, firmly held in view.

Those principles resolved themselves into three :—

1. The ship's structure and means of propulsion should be such as to enable her to perform with unfailing reliability the service that was demanded of her. This service was to accomplish in all weathers, all the year round, a fortnightly service between Southampton and New York, instead of the three-weekly departures hitherto maintained by the fastest ships afloat.
2. Next, her passenger accommodation was to embody everything which the long and carefully recorded experience of the two greatest transatlantic shipping companies in the world could suggest as useful or attractive to passengers.
3. In the fitment and decorations absolute comfort should be aimed at in combination with distinction and grace, while a sense of unity should prevail throughout all the variety which would be achieved.

To solve such great problems, problems which prior to the laying down of the *Queen Mary's* keel no shipowner in the world had ever attempted to solve, required utilising the best brains and experience which this country can muster. It therefore entailed an enormous amount of committee work. It stands to the lasting credit of the Board and Management of the Company that, with so many different experts to consider, the final decisions were so sternly controlled at the centre that complete unity of conception was enabled to prevail. It speaks also very highly for the sense of good fellowship and mutual forbearance between all the experts concerned, that they entered wholeheartedly into the spirit of such decisions as were taken, and framed their final arrangements to fit in with these. It is this sense of unity and coherence which is among the most marked impressions which I have retained from my studies of the *Queen Mary* and my visits to her.

The next impression was that of a complete absence of any attempt at perpetrating "stunts" to strike the idle imagination. I have not come across any detail which does not reasonably spring from either some practical, or a perfectly sound artistic, consideration. It is this guiding principle which has enabled the

* *"Queen Mary" Supplement of The Morning Post,* November 19, 1935.

Board of the Company to maintain cohesion in the vast mass of decorative and artistic work carried out by a great number of artists.

I have frequently been asked whether there could be any cohesion in a piece of work to which so many individual artists have contributed. If you consider even the few slides which I am able to show you to-night, you will realise that the artists' contributions to the whole effect are, I say it in no disparaging spirit, of secondary importance; they are the finishing touches; they are not the essence of the effects.

The sculptors seem to me to have splendidly entered into the essentials of their tasks. Spirited as their respective contributions are, they all fall peacefully into their surroundings. In no place do they attempt to jut into prominence. Their works are intended to lighten and break up big spaces. This they do very pleasingly—but the big surfaces still remain the essence of the effect.

Not all the painters have, I think, equally grasped the need for their subordination to their surroundings. They have made good pictures, but often these might just as effectively be shown elsewhere, or other pictures put here. In two rooms only can it be said that the painted walls are of the essence of the rooms, and that without them these rooms would have to be reconsidered *de novo.* One of these is the little ballroom, decorated by Miss Anna Zinkeisen; the other the verandah restaurant enlivened by Miss Doris Zinkeisen. Even the very large painting by Mr. Philip Connard in the dining room provides little more than a very pleasing effect at one end of what is only a comparatively small part of the dining room as a whole.

In the same way, but rather more noticeably, being on lower sections of the walls, the delightful panels of Mr. Robert Carse in the same room brighten up the perspective.

The big effects depend everywhere entirely upon the beautiful disposition of the spaces, and the magnificent, yet utterly simple, treatment of the walls, ceilings and lighting effects. The veneered woods have been selected with a sound eye, not merely to their preciousness, but to their natural effects. The artificial patterning of timber, so repellent to all who have a liking for natural woods, is here completely absent. In the treatment of the big apartments, as well as of cabins and private saloons, the most has been made of the natural beauty inherent in a ship's camber and sheer lines, the Long Gallery providing an outstanding example of this. Every impression of angularity has been deliberately avoided by the rounding of angles, not only where walls and decks meet, but also in furniture and fitments. Thus, while structural features have been stressed, that sweetness of curves has been preserved throughout which is so marked a natural difference between ships and buildings ashore. The effect on passengers, subtle and unrecognised though it is, will be found especially valuable at those moments when even the biggest ships afloat are apt to lose their poise.

Interesting too, and as far as I know quite novel, is the manner in which the interior architects of the *Queen Mary* have in appropriate parts of the ship forsaken

the rigidity of symmetrical arrangement, dear to the heart of the shore architect, for the flow of repetitive rhythm derived from the structure of the ship. I would instance the treatment of the tourist class dining room as a very successful example. Another notable feature is the practical manner in which all walls, floors and ceilings have been finished. No materials have been used to this end which are not free from objectionable characteristics—such as inflammability, lack of resilience, a tendency to squeak or moan under strain, and similar weaknesses, and they have invariably been selected and treated with a view to convenience in maintenance and repair. In the swimming pools, for instance, the use of paint and tarnishable materials has been entirely avoided, so that a hose will suffice to keep every nook and corner of them clean.

The colour schemes have all been carefully adapted to the use that is to be made of the different rooms. They work up from the broad qualities of the panelling, as amended by the lighting effects, to the subtle touches in the furnishings. Most successful, as decorative adjuncts, are those paintings which, while picking up in their backgrounds the values of their surroundings, add to these the brighter accents that give liveliness to the scheme of the room. Mr. McDonald Gill's track-chart in the big dining room, and Mr. Edward Wadsworth's painting over the marble mantelpiece in the main smoking room are excellently attuned to their respective surroundings.

In the provision of fitments and of those practical objects the presence of which in the requisite spot adds so constantly to a passenger's convenience and well-being the *Queen Mary* exceeds any ship hitherto built. This care has ranged from a more extensive provision of single cabins and private toilets and bathrooms than is found in any other ship—to a unique design of coat-hangers which accommodates with equal convenience both male and feminine attire. Entirely novel is the fact that in addition to having a number of single-berth cabins in the tourist class, practically every stateroom in this class has either its own private bathroom or shower, or at any rate its separate toilet, reached from inside the cabin.

The arrangement by which all the dining rooms and restaurants in the first and tourist classes have their own galleys adjoining them, and not on a deck below, greatly facilitates the serving of the food in perfect condition, while sound-proof and "smell-proof" partitions provide a separation which obviates any disagreeable consequences of this close proximity between the places where the food is prepared and consumed.

An enormous improvement on current practice ashore will be found in the *Queen Mary's* chairs, and her specially designed pianos are exquisite and superior to any seen on land.

In the matter of furnishing fabrics the owners and decorators of the *Queen Mary* have paid a handsome tribute to British manufacturers. Having carefully studied the available fabrics at the Royal Academy Exhibition of British Art in Industry, at the Brussels Exhibition where the best Continental fabrics were to be seen, and generally at the various manufacturers' showrooms, it was decided

that British manufacturers produced such perfectly designed and toned fabrics, that there was no need to have any materials specially made for this outstanding ship.

In regard to carpets the general weakness of British, as of much Continental contemporary, design rendered it inevitable to have special designs and colour schemes produced. It seemed to me during my last visit to the ship that the carpets already laid down were most satisfying.

With this most incomplete reference to so magnificent a ship I must close this review of the *Queen Mary's* main decorative features. You will, I hope, have opportunities of hearing lectures exclusively devoted to the *Queen Mary* and to the *Normandie*, two vessels which seem to me to stand for the high-water mark of their nations' respective conceptions of ships and shipbuilding. You will then be able to see in detail in what manner the decorators of the *Queen Mary* have succeeded in combining practical simplicity of treatment with a constant retention of that sweetness of curved lines which is so typical of every good ship, and which is, even unconsciously, a source of satisfaction to passengers. You will then also appreciate the magnificent team work of which this fine ship is the result, and you will, I feel sure, have no hesitation in confidently expecting that the same spirit of extreme specialisation and coherent collaboration for the greater glory of this country's shipping and shipbuilding industries will be available when it comes to producing that next wonder of the world—the *Queen Mary's* sister ship.

Meanwhile, let us wish to the owners and builders all the success they so amply deserve, and to the grand ship " God Speed ! " on her great career.

ACKNOWLEDGMENTS

My attempts to make of this paper, if not a complete, at any rate a comprehensive survey of the general trend of ship decoration, would have been instantly doomed to failure, but for the advice, information and helpful suggestions generously provided by a great number of those having special knowledge of the subject. In so far as I have succeeded, the merit is theirs ; the shortcomings are my own contribution. I would thank all the Shipping Companies mentioned for the loan of photographs and slides, and in many cases for having had new slides specially made. I would also acknowledge my debt for much help and information to Lieutenant-Colonel E. A. Ewart of the P. & O., Mr. T. F. Tallents of the Orient Line, Monsieur P. de Malglaive of the Cie. Générale Transatlantique, Baron C. von Pilar of the Norddeutschen Lloyd, Signor G. Fedrigoni of the United Italian Lines, Monsieur L. Bouwman of the Nederland Line, Mr. H. R. Day of the United States Lines, Mr. Eric J. Warman of the Union Castle Line and Mr. D. Fuller of the Canadian Pacific Railway.

To the Cunard White Star Line and Messrs. John Brown & Co., Ltd., I am grateful for many happy hours spent on the *Queen Mary* in the course of her completion, and for opportunities to study the process by which the activities of such a vast number of experts and artists have been welded into one joint masterpiece. For an insight into the principles that have guided her structural and decorative features I owe thanks to our Chairman of this evening, also to Mr. G. McL. Paterson, the Cunard Company's Superintendent Naval Architect, and to Mr. E. C. Leach, the

Head of its Furnishing Department, while Mr. F. A. Derry and his staff have been indefatigable in getting out facts of interest, both past and present. Mr. J. M. McNeill and other members of the Board and Management of John Brown & Co., Ltd., provided me with most valuable views on some of the ships they have built, while Mr. J. C. Whipp, of Mewès & Davis, the London architects, and Mr. Benjamin W. Morris, of Morris & O'Connor, architects of New York, furnished me with many considered views and interesting ideas derived from their experience of the equipment and decoration of hotels and ships.

Like all those who have attempted to write or speak about ships I have found the erudition of Mr. G. S. Laird Clowes, as always generously placed at one's disposal, invaluable, and I have to thank the Director of the Science Museum for the loan of interesting slides. To the *Morning Post* I am indebted for permission to use a number of photographs, specially made for their *Queen Mary Supplement*, and to Mr. J. Hedley Keefe of that paper for many curious sidelights on early ships and their amenities.

Finally, I would thank Sir Percy Bates for his presence in the Chair to-night, a presence which, at a time when he must be more than ever burdened with work, we can only accept as a genuine tribute paid to the importance of ship decoration as a subject in itself. Coming from so eminent a shipowner this tribute will be valued the more by all those who believe that the interior fitment and decoration of ships is a sphere of activity in which this country need fear no comparison with the achievements of other nations.

DISCUSSION

THE CHAIRMAN, in opening the discussion, said : I want to join issue with Mr. de La Valette with regard to his strictures on the foreman joiner, because I am conscious that if not to the foreman joiner, at least to the foreman painter, we owe a good deal. There were certain painted cabins, the designs for which were approved by experts with the most amazingly high authority behind them, but the foreman painter said he would not apply the colours. He was told to do so, however, and in the end was proved to be right, for we had to take the colours off again. We have to be grateful to the foreman class and their mates for a lot in shipbuilding and ship decoration.

The lecturer's remarks on *The Great Eastern* have been interesting : partly because she was a forerunner of the ships of to-day, and partly because, although, as Mr. de La Valette has said, she seems to have been a failure as a passenger ship, she did a job of work that no other ship could do in laying the Atlantic cables. She also laid cables across the Indian Ocean at competitive rates with other cable ships.

Amidst all his remarks on illumination I did not hear the lecturer allude to gas, and yet as a matter of history the original White Star *Britannic* came out as a gas-lit ship, and I do not think it ought to be lost sight of.

I thought perhaps the most interesting part of the paper, apart from the ancient history, was Mr. de La Valette's discussion of the Italian and French ships in relation to the *Queen Mary*, and I spent some time this afternoon trying to think exactly how it was that those ships, all conceived at much about the same period, should have come out so different, and I am inclined to think that each country has produced the ships which it is best fitted to produce. There is a different atmosphere in a Cunard White Star ship from that which obtains in an Italian or in a French ship, and I think I am safe in affirming that in what we have done in the *Queen Mary* there is no intended challenge to either of those countries. In fact, rather, we have chosen to be insular.

If we had attempted to challenge we should have gone into foreign territory, and it would have led us straight into disaster. To travel on a French ship is to get into an entirely different atmosphere from what you get on a British ship, and it is that atmosphere, coupled perhaps with tradition, which to a very large measure governed what we have put into the *Queen Mary*.

Before I sit down, I should just like to allude to the extreme probability that before we have finished with this ship we shall find we have left something out, and in my edition of the story of Aladdin, in the supplementary tales of the Arabian Nights, I seem to remember that when Aladdin reproved the spirit of the lamp for not having completed the palace he had ordered, the spirit replied by admitting the impeachment but added that perfection was with the Almighty, and that it was for no one else to attain it.

MR. J. HAMILTON GIBSON, O.B.E., M.Eng., said : In expressing appreciation for this delightful lecture I might say, as a matter of interest, that the Institution of Naval Architects is just in the throes of its Spring Meeting. They meet in this very room, but of course they do not deal with decoration, but rather with structural matters, and that is why I came here this evening, to learn something of the artistic side of our work.

I am old enough to remember some of the early vessels which were shown on the screen, and I remember as a small boy making a voyage to America with my father in a vessel in which the saloon was right aft and the sleeping cabins opened off the dining saloon. The first-class compartments of those days were very much poorer than the third-class accommodation of to-day.

THE LECTURER, in reply, said : Referring to the Chairman's remarks, I have had to cut down the paper in reading owing to shortage of time, and therefore may have omitted some reference to the foreman joiner. I agree much more with the foreman joiner than with some of those who came after him in recent times. He was always practical, always workmanlike, and it was only when he tried to put " a spot of art " into his work that the trouble arose.

The question of the effect of colours upon people is important. Here, again, a reference to it will be found in the printed paper. The subject is one which does not yet appear to have been very closely considered in its bearing upon the interior decoration of ships.

The Chairman referred to gas on board the *Britannic*. I was not aware of that, but I was rung up this afternoon by Mr. J. Hedley Keefe who told me he had just seen a book in which was a contemporary woodcut of the *Great Eastern* showing that she had what looked like a powerful electric light on her foremast. Underneath were the words : " Electric light on the *Great Eastern*." I do not know whether that was merely an advertisement stunt, or whether there was any truth in it.

On the motion of the Chairman a hearty vote of thanks was accorded to the lecturer, and the proceedings terminated.

NOTES ON BOOKS

THE REVOLUTION IN PHYSICS, by Ernst Zimmer. Translated from the German by H. S. Hatfield. London : Faber & Faber. 12*s*. 6*d*.

Nowadays physics is a popular subject with the layman both in Europe and still more in America. There are those who point out that when the conclusions of the

physicist were to a reasonable degree within the comprehension of the ordinary layman, he was content to know nothing about them. Yet to-day, when the physicist works or dreams in realms where he tells us the public cannot follow him, the public widely clamour for instruction. Be this as it may, it is certain that the popular physical works of notabilities are widely bought, whether they be by English authors or, as in this case, by a foreigner. That physics has progressed nobody will wish to deny ; but whether the revolution brought about in its theories, which still largely lack experimental corroboration, will persist, is equally hidden : its popularity is perhaps associated with what it has to say in regard to our view of life as a whole.

Professor Zimmer writes to some extent for the many who are entirely untrained in physics but who wish to know what all the bother is about : it is also claimed that the book is a bridge between physics and philosophy. His book is highly recommended by the experts and therefore must be taken seriously by those who have followed Jeans and Eddington and wish to continue their reading. As the layman is aware, the physicist is prone, when cornered, to take refuge in mathematics : to him they can prove everything, to us they can equally prove anything, without carrying conviction ; and it is therefore more helpful to find the experts setting themselves the task of explaining things in non-mathematical language. We have, after all, the right to demand that any conception must be capable of being explained in terms ultimately comprehensible to us, before we are asked to consider it in earnest.

There was a time before Galileo and Newton when the world was thought to be ruled by demons and angels and to be confined in space and time between Heaven and Hell. The scientist replaced this representation by an exact and defined conception of the world, with happenings in it according to immutable laws, in which man could discover the fixed rules according to which events take place, and predict them with some accuracy. Finally we had, or perhaps have, reached the stage of believing that every human problem is a technical one, capable of being solved on a scientific basis, given the discovery of all the relevant facts.

In other words, the real world is thought of as a machine constructed in three-dimensional space out of interconnected parts moving according to definite laws. Suddenly the physicist tells us that he has penetrated beyond this conception, but he yet lacks simple language to tell us with what picture to replace it. The successive chapters of the book describe the nature of matter and of light according to classical physics, the new ideas in regard to the structure of the hydrogen atom and of higher atoms, and then pass on to quantum mechanics, the interpretation of matter waves, new discoveries, with a final chapter on Science and Philosophy. They make difficult reading and to the critical mind, who asks for proof, leave much to be said.

Foolish questions cannot expect a sensible answer : apparently, until we can ask a sensible one, the secrets of nature cannot be penetrated. To quote from the conclusions of the author, " either we follow a particle exactly in space and time, when its energy and impulse are only inexactly determinable and can no longer be described in terms of strict causality, or we operate with strictly causal energy and impulse, whereupon the arrangement in space and time becomes completely indeterminate."

It all sounds very exciting and mysterious. Meanwhile the busy ones amongst us will go on testing and proving, discovering and building up, making progress in the old way, leaving to the more leisured the adventure of following the author into these revolutionary realms of modern physics. E. F. A.

THE BUSINESS AND I. By W. J. B. Odhams. London : Martin Secker. 8*s.* 6*d.*

Mr. Odhams' name is familiar probably to millions, for millions read the papers he owned or printed. On resigning from the Board of Directors of his companies

in 1933, Mr. Odhams sat down and wrote this book. It is full of historical and personal matter that will entertain the general reader.

So long, of course, as the Press is " free," opinions emerge from its columns that are clearly those of individual men ; but our Press, like most modern institutions, has become so vast and tentacular that its personal aspects are more and more obscured.

In his first chapters, and again at intervals later on, Mr. Odhams strikes the personal note, and we see what the son was like of the hard-working native of Sherborne, Dorset, who founded the business about ninety years ago. When the boy was taken in, at the age of fourteen, he had a ten-hour day, and at first did not like it. He had, moreover, literary ambitions ; these he did not put consciously aside till " the death at the end of 1891 of his keenest and kindliest critic, his first wife, deprived him of all desire for further success here. . . . Henceforth the business was his chief concern."

The papers printed by Odhams were a mixed bag—*The Railway Times* and *The Guardian* for a start. There was the *County Council Times*, and *Lux*, a spiritualist paper over which Odhams became involved in one of their lawsuits. Apropos of lawsuits, it was a very good idea of the autobiographer to give us the chapter, " Mr. Bottomley in Court." Odhams, as everyone knows, were the printers of Bottomley's *John Bull*, and they were being sued together with the famous editor, whose forensic powers were certainly, as Lord Birkenhead said, " of the highest."

> Mr. Hayes (cross-examining Bottomley) : " Have you not now got placards all over London, reading, " Plain words to Lord Roberts ? "
>
> Mr. Bottomley : That was last week. This week's is, " The Prudential Company Unmasked." (Loud laughter.)

The episode was superb, and Bottomley and Mr. Odhams had to pay damages of a farthing each.

Mr. Odhams' connection with the Civilian War Claimants' Association was due to a tragedy which happened on January 28th, 1918, when a bomb from a German aeroplane fell on Odhams' premises, killing thirty-five of the people who had taken refuge there. There is humour in Mr. Odhams' account of the rebuff the civilians suffered at the hands of the law. Their case seemed simple, but when the judges had done with Rustomjee and the Emperor of China and Demurrer, the firm of Odhams was £74,000 to the bad.

But, of course, this book is a record of success, not of failure. On page 75 Mr. Odhams tells how he and Mr. J. S. Elias took over the *Daily Herald*, then selling 300,000 copies a day. To-day the figure is 2,000,000.

When Mr. Odhams was about to retire, he wrote a letter to his shareholders, telling them so. He received many letters in return ; from some of them he quotes, and very touching in parts they are. With wishes as cordial as those contained in the letters, let this review close.

P.B.

WETTING AGENTS

Everyone is familiar with the use of soap and alkalis, the knowledge of which, as cleansing and wetting agents, has been handed down through the ages, but few are aware of more recent developments in the use of specific wetting agents. These are based on the more intimate understanding of surface phenomena and the

conditions at the surface of a liquid which has been acquired by recent physical chemical research. In simple language it may be said that the molecules constituting the surface of a liquid behave differently from the liquid layers which lie beneath it; in fact, they behave as a thin, taut membrane and resist rupture by a force which is termed surface tension. It is this force which prevents a liquid from spreading over and wetting another surface. For example, mercury, which has a high surface tension, forms globules on a sheet of glass which do not wet it, whereas water will wet the surface and spread to a thin film all over it unless the surface is greasy. Ether spreads out to a thin continuous film on water, but another organic liquid, carbon disulphide, remains as globules similar to mercury on glass.

In industrial operations, it is essential that water or some aqueous solution should thoroughly and evenly wet a material which is being treated. In order to effect this satisfactorily it is necessary to add to the water a substance which will give it a greater capacity for wetting, *i.e.*, lower its surface tension ; quite small quantities of certain substances are able to effect this change. They consist essentially of long chain molecules with a polar head. This substance has an affinity for water and the result is that these molecules are concentrated in the surface layer with the chains sticking out from the surface at an angle and the polar head held to the second layer of water molecules. In this way the surface tension is reduced, or, in other words, the contact angle with the greasy surface to be wetted reduced. There are now a number of such substances available, a typical one being Perminal (marketed by Imperial Chemical Industries). Thorough and even wetting is an essential preliminary to such operations as scouring, bleaching, dyeing and many finishing processes in the textile trades. It is possible by use of a few per cent. only of suitable wetting agents to ensure uniformity of operation and better penetration and thus to increase the speed of the operation.

Certain groups in the wetting agents have an affinity towards greases, and their solvent action brings about good contact between their solutions and greasy surfaces. The solvent action only takes place at the surface contact between the solution and the greasy surface, the molecules of the wetting agent in the surface layer playing the part of a bridge. The understanding of these principles makes it possible to devise suitable wetting agents which give excellent results in textile processes ; it is our opinion that they deserve to be better known.

GENERAL NOTE

Week-end Course on the Preservation of the Countryside.—A week-end course of lectures on this subject has been arranged by the Bonar Law College, Ashridge, in co-operation with the Council for the Preservation of Rural England, from Friday, June 12th, to Monday, June 15th. The following is the syllabus of lectures :—

Introductory Address by The Right Hon. The Earl of Crawford and Balcarres, K.T., F.R.S. ; " The Pollution of Streams and Rivers," by Mr. H. F. Atter (Clerk and Solicitor, West Riding of Yorkshire Rivers Board) ; " Fires on Commons," by Lieut.-Colonel Guy Symonds, D.S.O., (of the Home Office) ; " Green Belt Round London and other Large Cities," by Sir Raymond Unwin, P.P.R.I.B.A. ; " Village Recreation Grounds," by Captain Kenneth Shennan (Hon. Secretary, Gloucestershire County Playing Fields Association), and " Education

in Schools and how Teachers can help," by MR. A. J. LILLIMAN (National Union of Teachers); concluding with a general debate on "Rural Amenities."

The fee for board and tuition is £2, payable on enrolment. Fellows of the Society who wish to attend the course should apply to the Secretary, Bonar Law College, Ashridge, Berkhamsted, Herts, as early as possible.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, MAY 25..Dunford House (Cobden Memorial) Association, at the Royal Society of Arts. 5 p.m. Prof. W. Rappard, "**The Common Menace of Economic and Military Armaments.**"

Industrial Psychology, National Institute of, at the London School of Hygiene and Tropical Medicine. Keppel Street, W.C 5.30 p.m. Dr. T. Bedford, "**Modern Principles of Ventilation and Heating.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. Kühnel, "**Later Islamic Painting.**" (Lecture I)

At London School of Economics, Houghton Street. W.C. 5 p.m. Prof. Dr. M. Bonn, "**The International Significance of the Colonial Problem. Lecture IV – Economic Security.**"

TUESDAY, MAY 26..Central Asian Society, Royal, at the Royal United Service Institution, Whitehall, S.W. 5 p.m. Dr. C. Weizman, "**The Jewish Position in Palestine.**"

Civil Engineers, Institution of, Great George Street, S.W. 5 p.m. Dr. M. E. Schneider, "**Recent Developments in Metallurgy and their Influence on Engineering.**"

Psychological Society, British, at 55 Russell Square, W.C. 6 p.m. Dr. T. M. Ling, "**Psychological Factors in Industrial Sickness.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. Kühnel, "**Later Islamic Painting.**" (Lecture II.)

At King's College, Strand, W.C. 5.30 p.m. H. Wickham Steed, "**The Control of Central Europe: a Historical Survey.**"

At University College, Gower Street, W.C. 5.15 p.m. Prof. Y. Hirn, "**Art and Aesthetic Contemplation.**" (Lecture III.)

WEDNESDAY, MAY 27..British Academy, Burlington Gardens W. 5 p.m., Prof. R. W. Chambers, "**Bede.**"

Psychological Society, British, at the Royal Society of Medicine, 1 Wimpole Street, W. 8.30 p.m. Prof. C. G. Seligman, "**Patterns of Culture.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. Kühnel, "**Later Islamic Painting.**" (Lecture III.)

5 30 p.m. Prof. A. D. Gibb, "**The Inter-relation of the Legal Systems of Scotland and England.**"

THURSDAY, MAY 28..Imperial Institute, South Kensington, S.W. 2.30 p.m. W. Weir, "**Nova Scotia.**"

Chemical Society, at the Institution of Mechanical Engineers, Storey's Gate, S.W. 5.30 p.m. Prof. R. Robinson, "**Synthesis in Biochemistry.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. Kühnel, "**Later Islamic Painting.**" (Lecture IV.)

At King's College, Strand, W.C. 5.30 p.m. H. Wickham Steed, "**The Control of Central Europe: A Historical Survey.**"

At University College, Gower Street, W.C. 5.30 p.m. Prof. G. D. Hicks, "**Thought and Real Existence.**"

At Royal Veterinary College, Great College Street, N.W. 5.30 p.m. Prof. Dr. L. de Blieck, "**Vaccination against Salmonella-Infection.**"

FRIDAY, MAY 29..Royal Institution, 21 Albemarle Street, W. 9 p.m. Dr. R. E. M. Wheeler, "**Current and Forthcoming Archæological Exploration in the British Isles.**"

University of London, at Courtauld Institute of Art Portman Square, W. 5.30 p.m. C. Dodgson, "**Original Line Engraving in England.**"

5.30 p.m. C. W. Crawley, "**The Negotiation of the Treaty of London (1827) and its International Effects.**"

JOURNAL OF THE ROYAL SOCIETY OF ARTS

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (*Tel. Temple Bar*, 8274).

PATRONAGE OF THE SOCIETY.

The Council have much pleasure in announcing that His Majesty the King has been graciously pleased to become Patron of the Royal Society of Arts in succession to His late Majesty King George V. His Majesty has been a Vice-Patron of the Society since 1921 and more recently honoured the Society by becoming President of the General Committee of the Exhibition of British Art in Industry which was organised by the Society in co-operation with the Royal Academy in 1935.

The first to hold the office of Patron of the Society was His Majesty King Edward VII who accepted the office when retiring from the Presidency on his Accession to the Throne. His Majesty King George V became the second Patron on his Accession in 1910.

PROCEEDINGS OF THE SOCIETY

INDIAN SECTION

FRIDAY, 13TH MARCH, 1936

SIR PATRICK R. CADELL, C.S.I., C.I.E., in the Chair

THE CHAIRMAN, in introducing the lecturer, said :—It is not necessary for me to speak on the subject of the meeting to-night because you have shown by your presence here that you realise what an important matter it is, and it is I think almost equally unnecessary for me to speak of the lecturer. In case, however, any of your memories require to be refreshed about him, I would remind you that he was, after service in one of the great Indian railways connected with the ports, for eight years Chairman of the Port Commission in Calcutta, and after that he was a member of the Indian States Committee which was appointed in 1932, in connexion with the proposals for a Federated India, to visit the Indian States. He thus has a thorough

acquaintance with the problems of the maritime states. Although he has always been a stout fighter in the interests of any local body of which he was in charge, he is essentially one of those fair-minded men, of whom perhaps there are not too many connected with the maritime interests of the great cities of India. He is not one of those who can see no good in any port except their own. I know nobody better qualified to address you on this subject.

The following paper was then read :—

THE DEVELOPMENT OF INDIAN PORTS

By Sir Charles Stuart-Williams

(late Chairman, Calcutta Port Commissioners)

It will readily be realized by those whom I am addressing this afternoon that there can have been few occasions in the history of India when the analysis of facts has been more difficult and the prediction of future tendencies more liable to error than the present day. In the first place, there is the aftermath—we hope this is a correct description—of the great international trade depression which—so far as India is concerned—commenced in the financial year 1930–31 and which even now gives us figures for India's overseas trade barely one-half of those of 1929-30. Figures of present-day trade are thus of doubtful value and especially so since they are stated in terms not of quantity but of value and are thus affected, though in a compensatory direction, by the marked decline in values which forms a necessary concomitant of any trade depression. Again, as regards the future, we must take into account the important constitutional change represented by the Act of 1935 which is to come into full effect from the beginning of next year, a change which covers not only a great transfer of power and responsibility from England to India but also—which seems to me of even greater moment—the initiation of democratic control under conditions never before contemplated, and this at a time when democratic ideas and ideals are in some parts of the world struggling for their very existence. Inferences which under different conditions might be attempted with some assurance are to-day dangerous and unreliable. Consequently, I shall avoid, so far as possible, reliance on statistics and confine myself to an endeavour to bring out certain salient facts in their broader aspects and to draw such general inferences as seem reasonably assured.

The word "development" necessarily connotes, I think, the progressive realization of a policy aiming at certain ideals, or at least definite types, of achievement, and it is of some importance therefore to attempt a brief summary of what is generally understood by port development.

In bygone centuries, when neither steam nor internal-combustion engines were available, the primary concern of a ship and her crew was the safe conclusion of her voyage, and the primal attribute of a port was correspondingly that of a safe harbour —giving protection from the danger of dragging anchors and a lee shore—while the cost and speed of the handling of cargo was a secondary consideration. But with the progress of invention and the growth of the science of navigation, safe and

punctual voyages became the rule and disaster the exception ; concomitantly, there occurred a similar change in the conception of a port ; physical characteristics became of less importance and economic considerations of constantly greater moment. The harbour gave way to the port ; the handling of cargo was regarded not so much from the standpoint of safety as from that of economy and despatch—a tendency which rapidly developed as it became possible to transport commodities of lower and lower values at some profit.

At the same time, the safety of vessels remains a great and important factor, and at all times ports have owed, if not the fact, certainly the method of their development to its recognition. Thus, when the construction of the first dock system in Calcutta—the Kidderpore Docks—was mooted, it was largely as a result of the damage done in the cyclone of 1864, when the P. & O. Company alone incurred damage to the extent of over £100,000—a large sum expressed in the tonnage of those days—that wet docks were preferred to riverside jetties.

A modern port is in effect an important junction or point of transfer in overseas trade, either for a further voyage or to land transport—more particularly of course by rail, but also by inland water channels, whether natural or artificial, and now by road to a constantly increasing extent. The units of transport concerned, *viz.*, ocean-going ships, are much larger than the units of land transport, and the quantities of goods conveyed in them may thus make exceptional demands on the landward side, but, more than that, the goods conveyed change the whole nature and method of their transport ; they may, and often do, change their ownership, with all the consequential complication of damage claims, disputed ownership and storage facilities ; finally, they may—and often do—pass from one country to another and are then subject to control from several motives, economic, political or strategic.

The chief items of the necessary facilities and accommodation may be very briefly enumerated. There is first the safe entry of the vessel and her prompt berthing without damage—a service often involving the greatest skill and care and, therefore, now undertaken in all large ports by a local staff of pilots and harbour-masters familiar by training and experience with the channels, prevailing winds and currents, varying depths and other considerations ; and there are, of course, similar services on the vessel's exit. Next, the provision not merely of berthing accommodation, but also of ample transit shed and warehouse space, suitable cranes or other apparatus, water, and bunkers, whether coal or oil ; of adequate railway facilities and good provision for the access of road vehicles. Also, the presence of an ample labour force possessing the requisite skill and experience, of victualling facilities, hospital accommodation, means of recreation, and all the other ancillary services and trades which attend the voyages of large modern vessels. If, out of the facilities mentioned, there is one which more than another may be taken as the real test or criterion of a modern port, it is its ability to provide vessels with deep-water berths equipped with cranes, sheds, and railway facilities, and the number of such berths is a fair test of the port's traffic capacity.

Behind all this there must necessarily be a large, well-trained and costly

organization and in the case of modern ports, there are certain special features, of which two may be mentioned.

The first is the necessity of providing for a demand which fluctuates widely with the state of trade, in other words, of providing accommodation for a number of vessels which may vary by as much as 50 per cent. in comparatively short periods. In addition to normal variations which may be foreseen by anyone conversant with general trade conditions, there are cases where suddenly a profitable trade opportunity occurs and is promptly seized by some enterprising firm. I will give one example : in Calcutta there is a group of flour mills, mostly milling wheat for local consumption ; these mills were supplied by wheat grown in the United Provinces and the Punjab, and sent down by rail. Suddenly the price of Indian wheat rose while that of Australian wheat fell to an unusually low price. As a result, a vessel is signalled from the Sandheads without any notice or advice bringing in Australian wheat in thousands of tons for which immediate accommodation is expected, and for some time a considerable trade running into many thousands of tons is offered and suitably accommodated. No modern port would be happy if it could not deal with such emergent offers of trade.

The second point is the difficulty and expense of port development and the length of time taken in its execution. Each case presents different physical conditions and these need to be fitted, so to speak, to differing economic circumstances. Since the cost is always high, much consideration and deliberation is called for ; and since experts sometimes differ, and engineering experts certainly no less than others, this takes time and the administration often has to decide between varying expert opinion. The engineering " possible " must be grafted on to the economic " desirable," and the results attuned to the financial possibilities of the case. Even when plans are matured and finally settled, the mere execution of the work will involve years of strenuous endeavour, the overcoming of many unforeseen difficulties, with a possible disaster always looming in the background, before success is achieved and the accommodation which has been the cause of so much human endeavour is available for a trade, which may then perhaps have declined or failed to develop as expected.

But this is not all. I referred briefly a little time ago to the fact that goods frequently pass from one country to another when they reach a port, and of course must do so in all cases of international trade. The ports are thus the gateways of the country and, being limited in area and easily guarded, give exceptional possibilities of control. This control is of three possible kinds : (*a*) tax-earning control —in other words, customs, (*b*) protective control, *i.e.*, the levy of taxes designed to prevent or lessen imports in the interests of local production or manufacture, and, lastly, (*c*) strategic control, such as the restriction on arms, ammunition, etc.

With the last I am not concerned and merely mention it as a factor, fortunately, of no great economic importance. But the two other controls are important and serious. It is obvious that all import and export duties hamper trade, though economists hold that an export duty on a strict monopoly of a more or less indis-

pensable character may be passed on to the consumer with small loss in trade. Revenue-earning customs duties on a high scale—and some of India's duties are enormous—are a serious handicap; fifty per cent. on household necessaries which cannot be made in India is hardly calculated to encourage trade or indeed to produce revenue. Such duties reduce import trade and inevitably have repercussions on the country's export trade also. Their full and ultimate effect is rarely foreseen and is in some measure incalculable, since there is no one to voice the real result to the mass of consumers. Again, the very necessity of secrecy before the announcement of any such changes makes them as convenient to the Finance Minister as they are momentous to overseas trade. As to the present policy of "economic nationalism," now so prevalent and not least in India, this also affects not merely the trade in the commodities primarily concerned, but in those which balance the protected trade and even beyond, while committing the country concerned to a policy exceedingly difficult to modify in the light of experience, whatever the total results may prove to be. Moreover, the loss of income from goods, formerly imported but now subjected to prohibitive duties, makes the collection of an adequate sum from the remaining items of the country's import trade a matter of increasing difficulty, and when—as in the case of India—the customs revenue is by far the most important factor in the national budget, this is a serious consideration.

From both classes of duty, the administration of a port is thus exposed to the risk of changes which may materially reduce or modify a trade carefully nurtured for years and for which elaborate and expensive accommodation has been provided.

The administrative position in regard to ports as it now exists is peculiar. In most countries, I think, the supervision of port work rests either in the federal or the constituent state government. In India it vests in the central government for the "major" ports, which to obtain that status must handle a certain specified volume of trade and be administered by an *ad hoc* authority, while, for the less important places, it vests either in the provincial government or in that of an Indian State. The arguments for centralizing the administration of the larger ports are weighty and I think conclusive. They are, briefly, the international connections of such places, which include matters of quarantine and labour regulation, applicable to ships of all nations and trade from all over the world; secondly, the vital connection with the railway system, which is centrally administered and the fortunes of which are an important factor in the Federal Budget. At the same time the desirability of retaining the local bodies which have for years successfully administered these ports can hardly be over-stated. I shall refer to this question a little later.

The Major Ports

The following are the major ports in order from the west: Karachi, Bombay, Madras, Vizagapatam, Calcutta and Chittagong, while Rangoon is at present recognized as an Indian major port, about to be transferred to the independent State of Burma.

If we consider the trade figures for the whole of British India in relation to those

for the major ports, we are at once impressed by the relatively very high proportion for which the latter, particularly Bombay and Calcutta, are responsible. Thus, the figures of British Indian trade for the year 1933–34 (which are less than one-half those for 1929–30) are as follows :—

Imports	*Exports*	*Totals*
Rs.115.3 crores	Rs.149.7 crores	Rs.265.0 crores

and those for the major ports, commencing on the west, are—

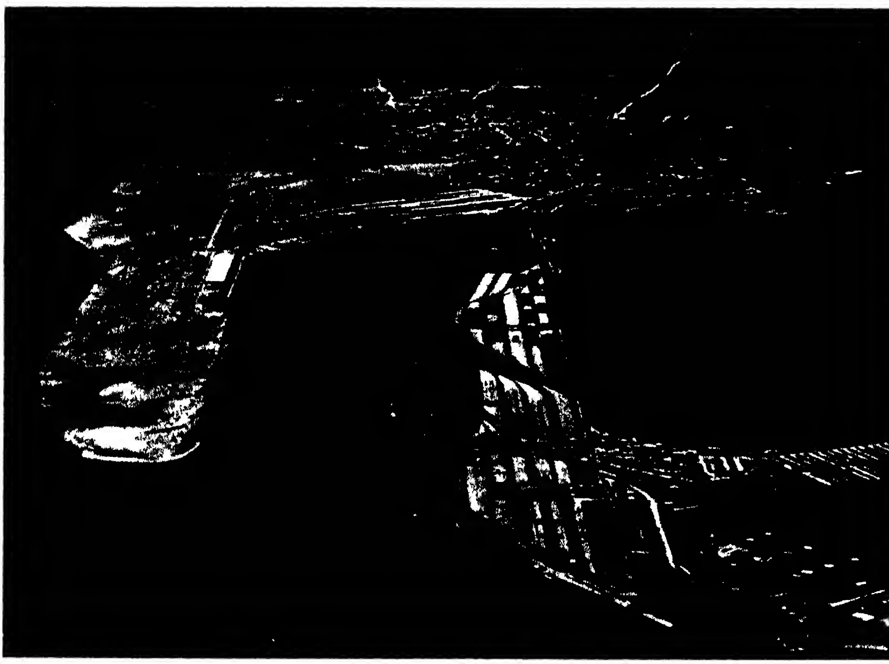
	Imports	*Exports*	*Totals*
Karachi ..	Rs.12.96 crores	Rs.14.22 crores	Rs.27.18 crores
Bombay ..	46.16 ,,	29.49 ,,	75.65 ,,
Madras ..	11.18 ,,	9.7 ,,	20.88 ,,
Vizagapatam ..	.7 ,,	.39 ,,	.46 ,,
Calcutta ..	32.12 ,,	58.45 ,,	90.57 ,,
Chittagong ..	.07 ,,	5.23 ,,	5.93 ,,
Rangoon ..	8.46 ,,	14.94 ,,	23.41 ,,

giving a grand total of imports and exports of Rs.243.67 crores out of the above-mentioned total for British India of Rs.265 crores, or over 91 per cent. A similar comparison of the amounts of trade at major and minor ports in each constituent province leads necessarily to a somewhat similar result, but in the Madras Presidency, where the length of the coast-line lends itself to the establishment of a large number of comparatively important coast ports, the preponderance of Madras port itself is much less marked, and this tendency will, of course, be accentuated by any future development of the new port of Vizagapatam, already ranking as a major port, although by no means the next in importance on present-day trade figures to the Presidency city.

The preponderance of these large ports in the aggregate ocean-borne trade of India is of course due to a number of causes. The purely historical cause is one, for Bombay, Madras and Calcutta were the main centres of administration for a century or so of rapid development, and this development brought with it not only a great increase of population, but a strengthening and elaboration of the forms of commercial and industrial activity inspired and supported by numerous trading houses staffed by men of capacity and vision. In addition, the railway systems designed and built during the latter half of the nineteenth century were based on these centres. Thus there arose the great arteries of rail-borne commerce which characterize the present-day position. On a somewhat smaller scale the same thing has happened in the case of Karachi serving Sind and the Punjab, and Chittagong serving Eastern Bengal and Assam.

Commencing from the west, the port of *Karachi*, though not perhaps possessing a "storied past," is already some seventy years old, as it began its history as far back as 1858. It enjoys considerable natural advantages ; lying more or less N. to S., it has Manora Point on the west giving some natural protection which has been reinforced artificially by the construction of a breakwater. On the other side,

the entrance channel has been defined and restricted by the construction of the Keamari groyne, and the carrying out of continuous dredging has increased the total of available deep water—within 20 feet contours—from 95 acres in 1858 to the present-day figures of 522 acres—out of which the Manora anchorage provides 118 acres good for mooring at all seasons. The moderate range of trade has made it possible to rely on deep-water wharves without the necessity of constructing wet-docks, and this method of development has been chiefly on the eastern side, where there are now seventeen berths for large ocean-going vessels varying in



KARACHI : GENERAL VIEW

length from 325 to 550 feet, fully equipped with transit shed, cranes and railway facilities—with an oil institution at the seaward end of the port. The recent demand for further accommodation is being met by the construction on the west side of a new system of jetties, of which three are at present completed ; two being fully equipped and each of them 575 feet long. The oil depot has a jetty taking vessels up to 550 feet and is equipped with ample storage accommodation for all classes of oil.

Bombay forms an excellent example of a port having great natural advantages which has been systematically developed on well-considered lines. The capacious and picturesque natural harbour with its convenient islands gives ample anchorage and has a bottom permitting of effective and economic dredging, while the adjacent

land lends itself to reclamation and there is a good supply of excellent building stone within easy reach.

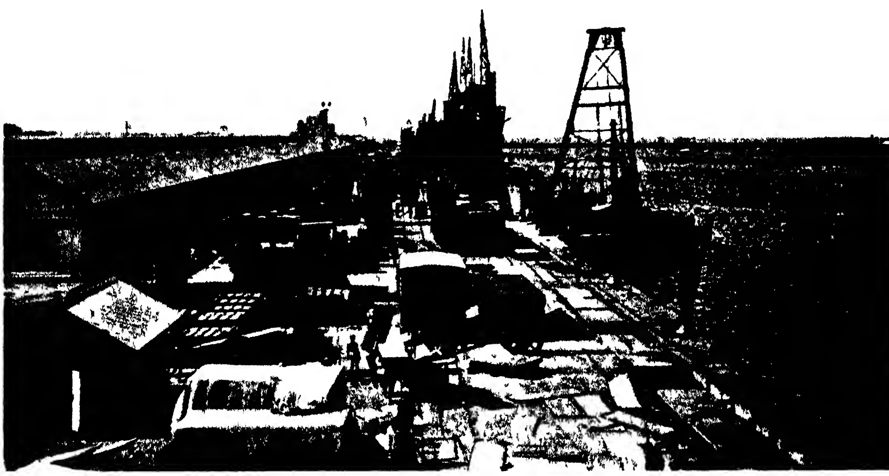
Bombay harbour has an area of some 4,000 water acres where vessels may lie at anchor within reasonable distances from the wharves—the depth of water varying from 23 to 40 feet L.O.S.T. On one occasion as many as fifty-two transports have been moored in the harbour—each vessel having a swinging area of 600 feet—with room to spare. In regular use, there are twenty moorings assigned for particular purposes and trades, of which five sets, with 40 feet of water available, provide for

BOMBAY : BALLARD PIER ; ALEXANDRA, VICTORIA, AND PRINCE'S DOCKS

specially deep draft vessels and four are reserved for petroleum, explosives or as quarantine berths.

The accommodation alongside wharves consists of three dock systems and the oil depot. The docks have been constructed by reclamation along the line of the old foreshore, *i.e.*, a line roughly N. to S. on the eastern side of Bombay Island. By 1886 Bombay had the Princes Dock, with an entrance width of 66 feet, and seventeen berths in commission, and also the Sassoon Dock with another five berths. Then came the Victoria Dock to the south of Princes, with an entrance width of 80 feet, and which in its present state comprises fourteen dock berths complete with transit sheds, partial rail facilities and a good equipment of cranes. But some time before the Great War the accommodation provided by the Princes and Victoria Docks was found inadequate, and the much more ambitious scheme of the

Alexandra Dock system was embarked upon on the seaward side of the older docks. This system comprises an entrance lock measuring 750 feet by 100 feet, with an adjacent dry dock measuring 1,000 feet long by 100 feet wide, giving access to a wet-dock with altogether seventeen berths for large vessels, of which fifteen are provided with transit sheds and cranes, railway facilities and ample road access. In addition there is a large passenger landing-stage—one of the best equipped and most efficient things of its kind—and a very useful harbour wall or bunder, giving 1,700 feet of quayage for small seagoing craft. The total length of steamer wharves and bunders used by country craft is over 8 miles in length and the



MADRAS ; THE NEW WHARVES

aggregate area of docks and estates—the latter mostly obtained by reclamation work carried on over many years—is 1880 acres.

Madras has none of the physical advantages of either Bombay or Karachi, and the construction of a port on this exposed coast is something of a *tour de force*, only made possible by the construction of expensive protecting groynes, the upkeep of which has at times caused anxiety. Within these projecting arms there have been provided berths with cranes, sheds and railway facilities for six steamers, with additional moorings for eight vessels, of which three are used for oil-carrying vessels. The port is well served in the matter of railway connections, and is adequately equipped for the trade offering, which is much less of a terminal kind than at Karachi, Bombay and Calcutta ; in other words, of the liner ships calling at Madras a great proportion proceed to Calcutta, and leave or collect only a portion of their cargo at Madras.

Vizagapatam is the most recent of India's major ports and its present position is peculiar in certain respects. It is not adjacent to any great centre of population, and the hinterland is not as yet highly developed either agriculturally or industrially, though it has rich mineral deposits, chiefly manganese ore and coal. But on the other hand it has certain physical advantages; it is well-situated on the coast, roughly halfway between Madras and Calcutta, and possesses on the southern side a bold headland called the Dolphin's Nose, which partially protects the entrance on that side, but was not found to obviate the difficulty arising from a northerly drift, so that further protection has been found necessary on the south as well as that always contemplated on the north. The port has been designed and laid out on generous lines, providing for a much larger trade than as yet exists, as it is hoped

VIZAGAPATAM : HARBOUR ENTRANCE CHANNEL

that both the manganese ore trade may be found capable of marked development, and that this may lead to a growth of agricultural produce, particularly groundnuts, and, with the growth of population in the area, of general trade. The accommodation provided within the inner harbour consists of three berths equipped with cranes and railway facilities for general cargo and two berths specially designed for handling manganese ore and able to load over 200 tons per hour. There are also moorings for a further four vessels within the harbour.

We come now to the Province of Bengal, with the major ports of Calcutta and Chittagong. The whole trade of the province in the year 1933–34 was: Imports, Rs.32.8 crores; Exports, Rs.63.69 crores—a total trade of Rs.96.5 crores—a figure less than half that of 1929–30 in value. Out of the total, Calcutta accounts for no less than Rs.90 crores, or about 93 per cent., and Chittagong for the balance of some Rs.6 crores—or about 6 per cent., there being no minor port in the province engaged in overseas trade.

Calcutta is a typical river port, finding natural protection by the ability of ships to proceed on the height of the tide to positions secure from sea weather. It has all the natural disadvantages of being situated on an alluvial river without either high ground or adjacent rock or stone formation. The site of the city being 80 miles from the coastline involves an unusually long entrance channel and—since the presence of sandbanks near the mouth of the Hoogly involves dredging work far outside the estuary—the total length of the navigable channel is some 120 miles. The natural softness of the banks of the Hoogly and of the Ganges river system—of which it is one outlet—combined with the heavy rains during three months of the year, and strong southerly winds from the seaward side—all bring about immense movements of alluvium along the river bed, and the result is a long,

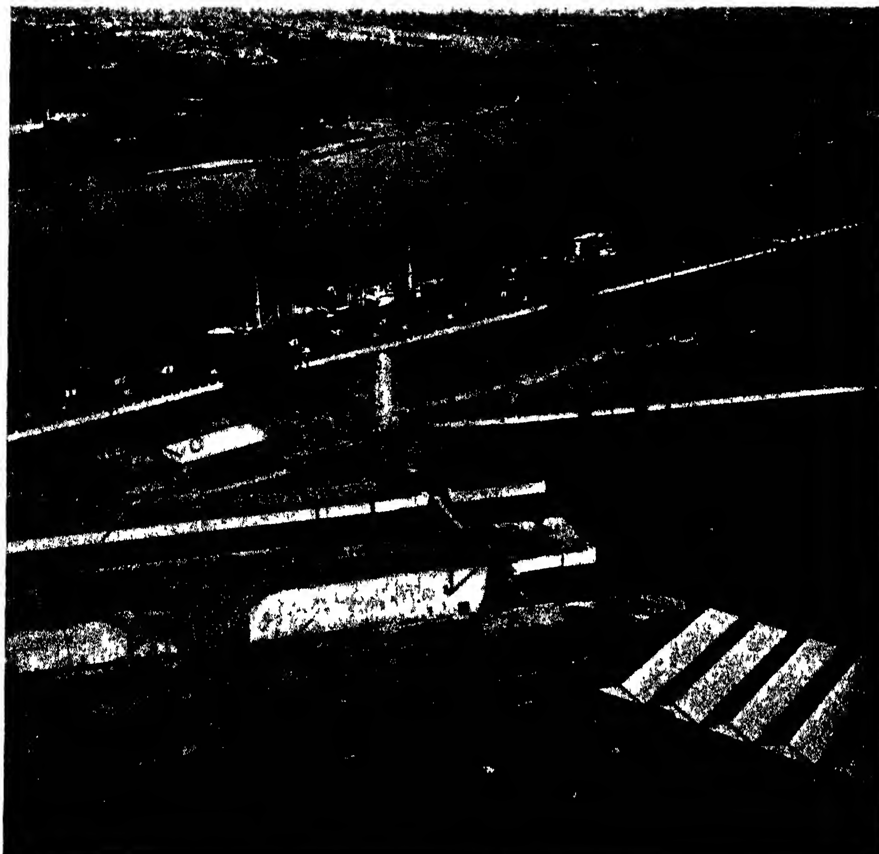
CALCUTTA : KIDDERPORE DOCKS AND TRADE DEPOT

tortuous and sometimes dangerous channel, which necessitates constant survey work, heavy and arduous dredging and maintenance work, and last but not least, the employment of exceptionally well-trained and well-paid pilots and harbour masters.

The port has developed *pari passu* with the city of Calcutta. After several abortive efforts to establish a suitable authority—one attempt failing from the Government's proposal to put the port under the municipal authorities, and another from the Government's failure to allow the newly-made port authority either any money or any power of obtaining it—the present Port Commission commenced work effectively in 1870, and has thus some sixty-six years of history.

Development has taken place along four main lines. The first was the obvious method of providing moorings at which vessels lay and discharged into, or loaded

from, lighters in stream. Some fifty-six years ago, when sailing vessels still formed a large percentage of the total number of vessels, the port had 228 such moorings for ocean-going vessels, of which 178 were fixed or double moorings and fifty were swinging moorings. The next stage was the provision of the Calcutta jetties, of which there are now nine, built alongside the bank in the old or business quarters



CALCUTTA : GARDEN REACH BERTHS AND KING GEORGE'S DOCK ENTRANCES

of the city, provided with transit sheds and storage warehouse, cranes and railway facilities, with good road approaches. Gradually these jetties have become more and more confined to the unloading of certain classes of import goods, as the construction of the Kidderpore Docks at the end of last century gave better provision for the export trade and later for imports also. This dock system now comprises seventeen general berths, all fully equipped with sheds, cranes and railway lines, and, at the southern end, ten berths for the loading of export coal, of

which two are fitted with specially designed crane equipment. The fourth period covers the post-war development, when four additional general modern berths and a coal berth were constructed further down stream in Garden Reach and the first part of a new dock system called King George's Dock, which comprises modern entrances for the largest possible vessels capable of using the port—a double dry dock and some five well-equipped berths, one of which is used for inland steam vessels. In addition, there is at Budge-Budge, some 12 miles down stream, an oil depot with seven berths and transit shed and storage equipment.

There are now sixty-two river moorings altogether, of which fifty-four are in Calcutta and eight at Budge-Budge. The port can thus provide for a grand total of 116 ships, of which fifty-one can be accommodated alongside a jetty or wharf, equipped with appropriate facilities and accommodation. There is excellent rail connection with the three important systems which serve the central and north-east portions of the country.

The port of *Chittagong* is on smaller lines. It also is a river port, but with a much shorter channel and with fewer physical difficulties. There are five berths equipped with cranes and railway facilities for general cargo, and there are two sets of moorings in the port for overside work, and two more situated some 3 miles below for discharge of bulk ore. The port is served by direct connection with the Assam-Bengal Railway.

Rangoon will shortly pass outside the jurisdiction of the Indian Government, but brief mention may be made of its leading features. It is essentially a river port like Calcutta, and there are many points of similarity, both natural and administrative. But it has a special characteristic, *viz.*, that its great staple export, rice and paddy, is handled in the stream at moorings, where the vessel is served by lighters and country boats which bring the rice from rice mills situated on both banks of the river. Hence, while the tonnage and value of Rangoon's trade reach high figures, it is found that two wharves, forming a continuous structure accommodating seven vessels, fitted with cranes and possessing good railway facilities, is sufficient for the loading and unloading of general cargoes. There is also an oil wharf for Admiralty oil tankers, but other oil is discharged at special moorings, Rangoon being, of course, an oil-exporting rather than an oil-importing port. The moorings for ocean-going vessels now comprise twenty-one swinging and fourteen fixed moorings, in addition to four for oil tankers.

The Minor Ports of British India

As might be expected, the number of these in each of the maritime provinces is roughly in proportion to the amount of their coast-line. The province of Bombay, with its coast line extending from the western side of the Gulf of Cambay down to Goa, includes a number of minor ports, two of historical significance, *viz.*, Surat and Broach, and others with a coasting trade of some importance, *viz.*, Ratnagiri, Malwan, Vengurla, Karwar, and Honavar; but it cannot be said that any of these places are of great moment as regards international or overseas trade, save as

feeders to Bombay. They despatch chiefly mahwa flowers, wheat and cotton, and take in molasses, rice, betel, timber, coal, iron and coconuts for local consumption. Those north of Bombay are not far from railway facilities, though not, I think, directly served; while those to the south are some distance from the railway. Their equipment for large vessels would probably involve an expenditure out of proportion to the potential trade development, having regard to the proximity of Bombay.

The province of Madras, with its double coast line, possesses a large number of minor ports of greater importance, one of which, Cochin, already attracts visits from the ships of several well-known lines in the Eastern trade. Those with a trade—in 1933–34—exceeding Rs.1 lakh per annum number seventeen, of which the chief are Mangalore, Cannanore, Calicut, Cochin, on the west, and Tuticorin, Dhanuskhodi, Negapatam, Cuddalore, Masulipatam, Cocanada, Bimlipatam and Calingapatam, on the east. Of these the three with the largest trade in the year under reference were Cochin, Tuticorin and Calicut.

The port of Cochin requires special mention, in that it has been carefully developed on lines which should eventually make it a place of definite importance. Cochin has several important physical advantages, combined with a complicated and difficult administrative position. The waterways which lie adjacent to the coast line along this part of the south-western coast give it the advantages of a fresh-water spill, and it is a comparatively easy matter to maintain, with only a moderate amount of dredging, a good deep-water channel into the inner harbour. As stated in the Report of the Indian States Committee of 1932—

> " the port of Cochin in its present state is a British Indian port and not an Indian State port, but it is a fragment of British India standing in absolute isolation, and its development is dependent upon the co-operation of the neighbouring State of Cochin."

Without this co-operation it would be impossible to bring the railway line alongside the proposed deep-water berths on the island which is the proposed site for further development, and there is some controversy as to the exact border-line between the British Indian and the Cochin State portions of the harbour. The position is complicated by the existing arrangements for past and future finance, and as regards Customs dues. So far the amount spent on development is, I understand, less than Rs.1 crore, but more will be required, probably at least another crore of rupees, to give the place full facilities. The settlement of the points in dispute and, if possible, the adoption of Cochin as a major port by the Government of India, are indicated as desirable both by its strategic position between Bombay and Colombo, and by its traffic potentialities.

Of the other places mentioned, nearly all are situated on a difficult coast, exposed to the full force of the monsoon and with deep water a great distance away, so that the dredging, and even more the keeping open, of a deep-water channel for large vessels present great difficulties and would involve, of necessity, expensive protection at a cost out of proportion to the probable trade development. It is difficult

to see, therefore, that they are likely to change to any great extent in their main characteristics, or to lose the disadvantage under which they suffer of requiring long journeys in lighters or surf-boats for all goods handled even in fair weather, and of being altogether unable to handle cargo during the worst parts of the monsoon. At the same time it must be remembered that these places serve a well-developed and highly-populated hinterland, and that they ship large quantities of produce, particularly ground-nuts, and that they thus possess great importance in the trade and commerce of the province.

I do not propose to deal with the minor ports of Burma, in view of the approaching separation of that province, save to say that they are of definite importance and with considerable potentialities of successful development.

The Indian States Ports

The ports within the jurisdiction of the Indian States fall into two main groups, those of the north-west part of India, *viz.*, Kathiawar, and those to the south-west in Cochin and Travancore.

With the exception of Cutch, which remains in splendid isolation, all these ports have adopted the provisions of the Indian Sea-Customs Act, and thus undertake to levy customs duties on the same lines and the same scale as is the case from time to time in British India. In so far as the goods on which these duties are charged are consumed within the confines of one or other of these maritime or adjoining States, the sums realized are retained by the State, and they account to the Government of British India only for such portions of the goods as pass over into British Indian territory.

As regards their administration, there is an important point of difference between the ports within Indian States and those in British India. The latter are financially dependent on their own resources, and are under the strict obligation of confining their expenditure within the limits of their own revenue. The whole of the customs duties levied thereat must, down to the last pie, be credited to the Federal Government, which of course maintains a separate staff for the purpose ; and, as we have seen, the customs duties imposed, so far from assisting the port in any way, may be so raised or modified as to restrict or even to kill an important trade for which the port has provided elaborate and expensive equipment. The Indian State ports do not regard the question quite in the same light: to them, the attraction of trade to their shores is " a consummation devoutly to be wished," and though separate port accounts are in some cases maintained, it is not clear that in all cases the very favourable conditions offered are remunerative to the port administration, regarded as a separate undertaking. Consequently it is necessary for the Government of India to ensure the realization of full customs duties on all goods passing into British India.

The chief ports in Kathiawar are: in the State of Cutch, Cutch Mandvi and Kandla, of which the latter place has been developed on modern lines ; in Morvi, the port of Navlakhi, also suitably developed ; in Nawanagar, the port of Bedi

Bunder ; in Baroda territory is Port Okha ; in Porbander, the port of that name ; Virawal in the State of Junagadh, Mongrol and Bhavnagar in the States of those names.

Of these places, natural conditions prevent the best form of development, *viz.*, provision for large vessels alongside jetties or wharves, except in one or two cases, notably Port Okha, and it is found necessary to rely on the transfer of goods by lighters, but these are of modern type and are towed by tugs between the anchorage and the port. At all places such provision for ocean-borne trade has been made as is reasonably practicable, and the States themselves take the greatest interest in and attach great importance to this work, though the whole volume of trade handled only reaches a small percentage, probably to-day less than 5 per cent., of that of British India.

The port of Bhavnagar is specially privileged: to quote the words of Lord Morley : " So long as His Highness fulfils his part of the Agreement (the reference is to two Agreements dated 1860 and 1861, in which the place is promised ' the full benefits of a British port ') it is not open to Government to hinder or tax the land trade of Bhavnagar by the establishment of a customs line," so that at Bhavnagar any goods may be imported and passed on to British India without challenge to the State's right to retain the customs duties levied thereon.

In the south-west of India, the State of Travancore has a lengthy coast line, on which are situated, in addition to Cochin already mentioned, the ports of Alleppey, Quilon, Trivandrum and Colachel. Of these places, Alleppey, which has a roadstead giving safe anchorage practically at all times of the year, is the most important, and it has handled in several years some Rs.5 to Rs.6 crores of import and export trade.

The ports situated in the Indian States are regulated entirely by the States themselves, and have no relations with the Government of India, save as regards customs duties levied under the Indian Acts.

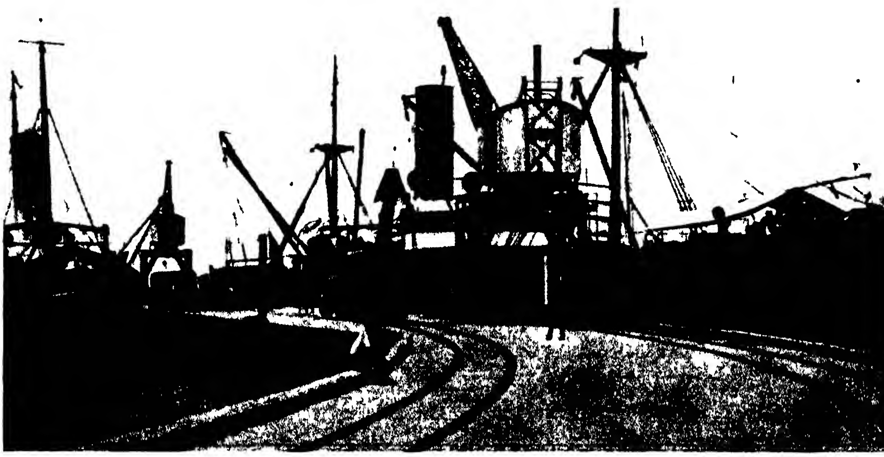
This brief and imperfect survey of the existing position will, I trust, show to some extent the ground on which further development must be based. It is clear that certain matters of administration will require attention at an early date, if indeed they are not already under consideration.

In the first place, there is the future of the six major ports, excluding Rangoon. These now derive their authority from Provincial Acts, in some cases old and frequently amended, and the present arrangement under which the Provincial Government administers these Provincial Acts, acting as agent for the Central Government, obviously requires attention. But it is difficult to see how this can best be done. One Act for the whole of India would involve insuperable difficulties, and the solution may possibly be found in a widely drawn Act regulating the general position of the major ports with a continuance, *mutatis mutandis*, of the present arrangement under which all matters of detail are relegated to Provincial Acts.

Whatever arrangement be adopted it seems clear that more effective liaison is required with the Customs Department and the Railway Board. After all, a

Federation should neglect no opportunity of finding and cultivating a common interest, and the existing position has, as I have tried to show, very definite disadvantages from the point of view of Port Authorities. It seems to me clearly desirable that full advantage should be taken of the knowledge and experience of the Port Authorities when changes, calculated to effect great changes in overseas trade, are under discussion; and, as regards railway policy, that this also should take into account not only the intrinsic importance of overseas trade, but also the desirability of encouraging coastal trade as a nursery for the mercantile marine of India.

Then, as to the future of minor ports, which will presumably remain the care of



PORT OKHA : THE JETTY

the Provinces, I have indicated my view that, with the possible exception of Cochin, where considerable capital has already been expended, but where there is some difference of opinion about the desirability of further heavy expenditure, there are no obvious cases where development designed to reach the standard of modern ports can be carried out without very heavy expenditure, the justification for which is not as yet apparent. But it would, on the other hand, be a mistaken policy to under-estimate the possible future importance of many of these places, which both in the Madras Province and in Kathiawar handle large traffic, or to aggravate in any way the obvious difficulties of their development. Certainly, a policy which deliberately encouraged the existing major ports at the expense of less important places is to be deprecated. Just as the manager of a big store welcomes the opening of other shops near him, so a big port should welcome the development of smaller places which will increase coastal trade and, directly or indirectly, benefit the larger port. Thus, it is desirable that the way be indicated for the financing—under suitable regulation—of development work at places where natural and economic conditions give promise of success.

As to the Indian State ports, I understand there is no likelihood of any marked change in the position I have briefly indicated above. But it would seem desirable that eventually the whole of India's coast line should not merely be regulated by the same customs tariff, but administered by the one department, as is done, I think, in all big Federal States. This would make not only for efficiency and uniformity, but should, under an appropriate settlement, do away with any necessity for internal customs cordons.

Conclusion

Thus far I have referred, by implication at all events, to the maintenance and improvement of the overseas trade of India as an end intrinsically desirable, but I am aware that there may be difference of opinion even on this point. Views are expressed and proposals put forward at times which imply that there is something essentially beneficial about export trade and something essentially detrimental about import trade, ignoring the obvious fact that they are necessarily interdependent; and there are others who would apparently urge a policy of economic isolation as an end desirable in itself and to be advocated even at a heavy cost. But, accepting the position that the policy to be adopted must in any case be determined by the interests of India herself, it seems to me quite clear that those interests will best be served in the future, as in the past, by a policy which recognizes the necessary interdependence of the great trading countries of the world; a policy which, recognizing also the need for a large expenditure of capital, both to develop still further the natural resources of India and to improve the health and strength of her peoples, will to that end encourage her export trade, more particularly with the rest of the Empire, where to an increasing extent she is most likely to find suitable markets for her produce, and at the same time place no avoidable obstacle in the way of an import trade which will balance her exports and also meet the growing requirements of her peoples, as their standard of living enjoys that improvement which it requires and which we all hope to see attained.

DISCUSSION

THE CHAIRMAN, in opening the discussion, said :—I think you will agree with me that you have heard a most interesting and comprehensive paper. The only omission I noted—which was probably intentional—was that no mention was made of Marmagoa, in Portuguese territory, which has been created, very unfortunately, as a port connected by rail with British India in place of the very beautiful port of Karwar in adjoining British territory.

Two points especially struck me. The first was the great work that has been done by the various Port Trusts and Commissions. This can only be fully realised by those who can remember what these ports and places were like thirty or forty years ago. Take Karachi, for example. Forty years ago it was one great expanse of mud and mangrove swamps : now it is one of the major ports. The second point was the moderation of the lecture. There was practically no mention of the great financial difficulties under which the Port Trusts and Commissions of India have worked in the last few years, which I venture to think is largely due to the lack of

support they have received from the Government of India. As the lecturer pointed out, the Port Trusts and Commissions have supplied the means for collecting a vast revenue for the Government of India in the way of customs duties, and the imposition of these duties was not in keeping with the interests of the ports themselves. During that time the Government have given no financial assistance to the ports, which are unable to raise their rates beyond a certain point. Naturally, the great works at the ports have had to be carried out on borrowed capital. There are heavy charges to pay, and the rates must be kept within limits, firstly, because of trade requirements and, secondly, because of the competition of Indian States. It is sometimes made almost a reproach to the Indian Maritime States that they use their customs receipts to improve their ports and reduce their charges. But they have every right to do so, even if it is not done in British India.

I have come very recently from an Indian State which possesses one of the ports to which the lecturer has referred, and very naturally I regard very sympathetically the efforts of the Maritime States to make full use of their ports. Not only are such ports the natural inlet for the entry of goods into a large part of India, but also in many cases they are very ancient ports, which have been merely re-created by the construction of railways and the increase of steamship facilities. The wish of the Maritime States to take full advantage of the ports must, I think, be treated with every consideration. Having said so much, I hope I shall not be regarded as unsympathetic towards the States when I add that I feel sure that, as the lecturer has suggested, all these States should be brought under one federal system of administration. We all know that serious abuses have occurred ; we believe the States themselves are willing to stop such abuses, and in most cases they have been stopped. But so long as there are different administrations and standards of efficiency, there are bound to be complaints. People will be suspected of doing wrong, which is almost as disturbing as the wrongdoing itself.

I think it essential that all States should be treated alike. The lecturer has mentioned one port in Kathiawar which has been given very exceptional and favourable treatment. The other States cannot but regard it as inequitable that one State should have this special treatment.

Sir William Sharpe said :—As a former fellow worker with both the Chairman and the lecturer in the field of Indian port administration, I welcome this opportunity of congratulating Sir Charles on his very interesting and informative paper. A well-known economist recently remarked that no matter how eloquent one might wax on the subject of imports and exports, nothing one said would be remembered by one's audience five minutes later. Whatever may have been the experience of the economist in question, I think Sir Charles may rest assured that we have followed his paper with close interest and that it has given us food for reflection.

I do not think there is much I can usefully add to his clear and concise description of the major ports of India. His synopsis has conveyed an adequate impression of their size and equipment. Speaking for the port with which I have been connected—Bombay—I may say that on occasions when I have wished to advertise the extent of its activities, I have been guilty of the boast that Bombay handles over its wharves and bunders a greater annual tonnage of cargoes than passes over the wharves of the Port of London. This claim does not, of course, apply to the total tonnage of the port, but Bombay does normally handle over its wharves some five to six million tons of cargoes every year, and in its best years has approached the seven million ton mark. The major ports of India represent many years of

engineering skill and enterprise, and a correspondingly large lock-up of capital. The Port of Bombay, for example, has cost between seventeen and eighteen millions sterling to construct and develop and, as it is not subsidised or assisted in any way, the overhead capital charges are naturally a heavy financial burden on the trade of the port.

As regards the future, I was very interested to hear Sir Charles' opinion that the arguments in favour of centralisation of the ports are weighty and conclusive. If centralisation connotes intelligent co-ordination of India's various transportation services and the adoption of a national transport policy workable on practical and efficient lines, I am sure we all agree with his opinion. Everyone conversant with trade and transport conditions in India to-day is cognisant of the fact that there is at present serious lack of co-ordination between the various branches of transport —the ports, railways, coastal shipping services, road transport concerns, etc. This defect is not, of course, peculiar to India ; it is to be found in many other trading countries. But the most progressive countries are doing their best to remedy the defect and it behoves India to do likewise. Lack of co-ordination in transport means wasteful competition, unnecessary and expensive duplication of services, a multiplication of tariffs and regulations and uneven rating, all of which hampers trade. The sooner India gets down to this problem the better it will be for her trade.

Sir Charles has, I think, somewhat over-emphasised the possible difficulties of centralisation and co-ordination. The question was, I think, first taken up by the Government of India some twelve years ago, and considerable progress was made with the preliminary drafting of a comprehensive Act suitable to regulate the constitution and general working of the major ports. More urgent problems have somewhat pushed this matter into the background, but it is to be hoped that consideration will shortly be resumed. A national transportation scheme which, with suitable adaptations, might possibly serve as a model for India's requirements exists in the Union of South Africa. Canada also has a scheme in hand.

One of the possible advantages of centralisation, bearing on the future development of Indian ports and future transport policy, lies in the direction of the establishment of a central *cadre* of expert port engineers, which would enable the services of these experts to be utilised in whichever port they might from time to time be most required. At present our best engineers are not always afforded sufficient scope for their abilities and experience, which might be more valuable if their services were interchangeable.

The Chairman has referred to the thorny problem of the competition of the ports belonging to the Maritime India States, a question with which his administrative experience has made him fully conversant. It is to be hoped that the negotiations in progress will soon bear fruit, and that the advent of the new Constitution will hasten a permanent solution of this problem.

MR. D. S. ERULKAR said :—Sir Charles Stuart-Williams' very interesting paper raises some important questions in regard to the past and future development of Indian ports. One fact however, stands out very conspicuous, and that is that for a coast line of 4,500 miles, and an area of 1,800,000 square miles, by far the bulk, 91 per cent. as Sir Charles points out, of the country's maritime trade is concentrated at seven major ports. Besides the seven major ports, there are over 150 minor ports to which the Indian Ports Act may apply. Yet, except for very few, most of these ports have no trade whatsoever. In consequence, the major ports are each in the nature of monopolists with their spheres of influence extended artificially, which tends to divert the healthy flow of traffic.

Before I deal with the railway policy that has contributed to this position, I wish to show that the present development of the major ports cannot be said to be healthy. Sir George Buchanan said in regard to Calcutta, " Calcutta cannot help being a large port and prosperous, one might say in spite of itself, because the history of port development in the past is not one of which Calcutta can be proud," and this might, I think, fairly apply to other major ports as well. There is no competition from neighbouring ports which seriously affects the efficiency and the working of the ports concerned. In this connection, I should like to refer to the Port of Calcutta.

If the revenue account is examined, it will be found that for the year 1934-35, out of a total income of Rs.306,19,818, Rs.78,26,956, or nearly 25 per cent., was derived from a charge called River Dues, which is levied on all cargo imported or exported at Calcutta, irrespective of whether it receives any landing or shipping facilities or not. When first introduced in 1893, this charge constituted a temporary measure then known as " special toll," levied with the express object of meeting any probable deficit that might arise, but by an amendment of the Calcutta Port Act in 1907, permanency was obtained in the shape of the present River Dues, and ever since the Port Administration has sought to lean more and more on this unreciprocative and unfair imposition. In 1934-35, taking the 1913-14 figure as index figure of 100, the income derived from this source had risen to 320. This entails a great deal of hardship, particularly upon the Indian public. For instance, large quantities of salt are imported into Calcutta and yet no facilities are provided for the discharge of salt, with the result that the Indian agriculturist, who largely consumes salt, has to pay for the long detention, ordinarily three weeks, of the steamer discharging salt at Calcutta, and in addition has to bear a levy of Rs.1.4.0 per ton, which goes to the Calcutta Port Commissioners without any compensating services or advantages to the consumer. It is significant that 6,000–7,000 tons of salt which takes 2½–3 days to load in Aden takes three weeks and even more to discharge at Calcutta. Dispatch of steamers should be the primary test of the efficiency of ports ; but the monopoly of the ports on the one hand, traffic having hardly any choice or alternative in regard to the port it uses, and wide powers, on the other hand, vested with the port authorities to levy charges which cannot be justified on the ground of service, do not in any way induce either efficiency or healthy development.

The reason why the minor ports have no trade is to be found in the fact that they are deprived of the facilities necessary for making them—what Sir Charles calls junctions or points of transfer. As Sir Charles pointed out, this can be by rail, inland water channels, or road. In India, it will be admitted that the bulk of traffic is transported by railways, and a reference to the railway policy in the past will throw useful light on the present state of the minor ports. The concentration of traffic at major ports automatically involves the diversion of traffic from points which might legitimately fall within the spheres of influence of minor ports. Indian railways have generally aimed at obtaining a long lead on the traffic they carried. With a view to diverting traffic by the rail routes, railways have in the past adopted a policy of deadly hostility to all the other forms of transport, particularly to water transport. A reference to the evidence given before the Ackworth Railway Committee will amply prove my statement, and in their relentless hostility towards water transport and in their anxiety to capture all the trade for the rail route and thus set up a monopoly of transport in India, wherever it has suited them they have sacrificed the interests of the ports concerned. Thus, the closing of the port of Tirumvasal and the notorious block rates of Broach are some examples showing how far railways have carried their hostility and, as suggested by the Chairman of the

Ackworth Committee, even to the serious detriment of the Indian public. Again, the deadly rate war waged by the railways concerned, who are armed with special powers to quote very low rates, with a view to "killing" competition by the Buckingham Canal, on which large sums of Indian money had been previously spent, and by coastal vessels on the east coast, are further examples of how the railway policy has relentlessly pursued the establishment of their sole monopoly.

Even the interests of the ports are not spared in this policy of capturing traffic, and the complaint in the latest administration report for the port of Calcutta about railways capturing coal for an all-rail route by the manipulation of freights is illustrative of what I have said above.

In regard to the minor ports, I should like to refer to the argument about the physical condition of the Indian coast not permitting of more ports. That is only partially true. Ports such as Cochin, Chittagong and Vizagapatam, which afforded excellent natural facilities, were not developed until very recently. As far back as about 1870, schemes were submitted to the Government for their improvement, and their development was recommended by harbour engineers of repute, as each of them affording excellent natural facilities. Yet, in spite of this, their development was not taken in hand until quite recently, that is, about half a century after the schemes were first mooted.

I wish to emphasise that it is not physical condition that has retarded the development of more ports on the coast of India, but lack of definite and bold policy on the part of the authorities in the face of divergent interests.

I have frankly criticised the railways and the ports, and I should like to end on a constructive note. It is high time that the Indian railways and the Indian port authorities realised the value of co-ordination between the various forms of transport. The full extent of the value of such co-ordination has been realised all the world over, and in other parts of the world the result has been the development, by means of cheaper forms of transport, of traffic which could not otherwise bear the high cost of railway transport and therefore, but for such co-ordination, would have been choked. In India, conditions particularly require the development of cheaper forms of transport, and if this were attempted under the fostering care of the Government, as has been done in other countries of the world, railways would find that they would benefit all the more by such a healthy development of traffic rather than by the present artificial and even unhealthy development of railways and ports.

MR. D. ROSS-JOHNSON, C.B.E., said :—I am afraid my experience in Madras is very ancient. I remember standing on the verandah of the railway office when a cyclone broke up the harbour in 1883. The harbour was redesigned and reconstructed and since then Madras has really become a great port.

As one whose fortune it has been to administer a British port for the last twenty years, it gave me great pleasure to hear the author's account of the ports in India. I felt envy when he was able to tell us that seven major ports deal with 91 per cent. of the total trade of British India. It may not be generally known that in the United Kingdom there are, I think, 121 ports which the Board of Trade consider of sufficient importance to classify separately in their statistics. India is a bigger country than England, but it is, I think, a great asset that it should be able to concentrate its administration and its capital expenditure into these few ports. If anyone could examine the figures of wasted expenditure in the United Kingdom in providing facilities at ports for dealing with trade which is already fully catered for in neighbouring ports, all the cost of which has to come out of the consumer's pocket, I think those interested in Indian ports would have a great deal to be thankful

for. The uniformity of administration in Indian ports is another good point. We have every form of administration in England, except state ownership. Our methods of administration can be classified under six different heads, and all have their good points, but when you see them all working alongside each other, you see there are disadvantages.

As regards the actual working of the Indian ports, all of us who have followed reports and statistics, have for many years admired the systematic and economical way in which the work has been done in all these Indian ports. When administering Bristol I had the pleasure of visits from the Chairman and officers of various ports in India, and I often found that I learnt more from conversation with them than they could learn from what I showed them. When the new constitution of India functions and has to deal with this question of the administration and constitution of their ports, the new Government will be fortunate to find that they are in the condition in which they are being maintained by their present very able administrators.

Sir Leopold H. Savile, K.C.B., said : I had the opportunity during the period of fifteen years that I was in Bombay engaged on the construction of the Alexandra Dock of reporting on several of the minor ports, including Vizagapatam and Cochin, and I think they show that Sir Charles may possibly be unduly pessimistic when he thinks it improbable that any existing minor ports are likely to develop into major ports. I do not think anyone visualized thirty or forty years ago that either Cochin or Vizagapatam would ever become a major port, although the undeveloped trade facilities there were extremely good for wide development.

I should like to say one thing which bears upon the co-ordination and central administration of these harbours and ports, with which I fully agree. Not being an administrator, I cannot speak with any particular authority on the matter, but I have some experience of the engineering side. The difficulty that I have experienced is that when any port, especially a minor port, requires advice on engineering problems, there is no recognized authority with the necessary engineering experience to which they can go for advice. Port Trust engineers have advised in the past, but it is not unusual for the advice they have given to be either pigeon-holed or deferred owing to want of funds to carry out the scheme. If there were a central authority to which questions of any proposed development of ports could be referred, and if this authority could call on the advice of engineers with the necessary experience of harbour and dock problems, they would be in a position to determine which schemes should be proceeded with, from an engineering point of view, provided they were otherwise justified.

Lieut.-Commander A. F. Inglefield said : A question about customs duties. I did not quite gather what the Indian system was, but some years ago I was engaged in port work in Brazil, and there they have a regulation that the import duties belong to the Federal Government and the export duties to the State Government. The bulk of the revenue of the Federal Government comes from these import duties, but one result of the system is that there are inter-State duties between the various States.

The Lecturer replied : I agree very largely with what Sir William Sharpe says as to what is being done in regard to co-ordination. But I am not very much attracted personally by the idea of one large all-India port establishment. I have had experience either directly or indirectly of both methods of working, the large establishment *cadre* with frequent transfers and the smaller *cadre* with greater continuity, and find that there are advantages and disadvantages attaching to both. I have been working for a number of years with the smaller *cadre* or " family " system, where you see a man

join as a youngster and rise to a high post, or, if he proves unsuitable, eliminated. There you have personal knowledge of the men, and I think the advantages of that are enormous. For my own part, I would rather have a staff recruited on those lines than be told that I can take my pick from the whole of India. I think the personal element in the working of a port is extremely valuable.

With regard to Mr. Erulkar's question of salt ; he made two points, one the charging of the river due and the other the slow rate of unloading. The river due at Calcutta was imposed purely as a temporary measure, but has proved to be very similar to Mr. Gladstone's income tax. Though it was hoped to take it off, this has not been found to be possible. The unloading of salt is not within the scope of the Port Trust, the actual unloading being done by firms.

Sir Leopold Savile referred to my possibly somewhat hasty generalization regarding the present minor ports. He may be right and I may be wrong. Some of them may prove to be easily and economically capable of development. But both Vizagapatam and Cochin seem to me to have considerable natural advantages not found at other places. Vizagapatam is a ready-made inlet with some fresh-water discharge, and at Cochin there are the lagoons, so that when the channel is charged from the bar outside the harbour, the fresh-water discharge helps materially to keep it open, especially as there is also the drainage from the hills behind. Therefore, although I naturally hope other places will develop, I cannot see any other port so well provided by nature as these two places. Nearly all the other ports on the Madras coast are in a position where ships dare not come close in in the monsoon, and work with lighters is difficult and expensive.

Commander Inglefield referred to the customs arrangement in South America. I think such a division between the Federal and the State Governments is an excellent idea, and if the Indian Provinces could keep all they could get in the way of import duties, I am sure they would be satisfied ! But a high tariff on goods coming into the country is a great handicap to trade, and when that tariff can be lowered, it will be a very good thing for India.

The Chairman then proposed a hearty vote of thanks to the lecturer. This was carried unanimously and the meeting terminated.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

TUESDAY, JUNE 2..University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T Rice, "**Islamic Art.**" (Lecture I.)

WEDNESDAY, JUNE 3..Central Asian Society, Royal, at the Royal Society, Burlington House, W. 5.45 p.m. C. P. Skrine, "**Kalat.**"

Folk-Lore Society, at University College, Gower Street, W.C. Rev. Canon J. A. MacCullock, "**The Fairy Changeling Belief.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, "**Islamic Art.**" (Lecture II.)

At King's College, Strand, W.C. 5.30 p.m. Prof. Dr. E. Prestage, "**The Portuguese in Abyssinia.**"

THURSDAY, JUNE 4..University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, "**Islamic Art.**" (Lecture III.) At King's College, Strand, W.C. 5.30 p.m. Prof. H. E. Butler and Prof. C. H. Williams, "**Giraldus Cambrensis.**" (Lecture III.)

FRIDAY, JUNE 5..Geologists' Association, at University College, Gower Street, W.C 7.30 p.m. (1) Prof. D. M. S. Watson, "**The Fishes of the Old Red Sandstone.**" (2) L. R. Moore, "**Some Eurypterids from the English Coal Measures.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, "**Islamic Art.**" (Lecture IV.)

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

THE SOCIETY'S ALBERT MEDAL

The Council of the Royal Society of Arts, with the approval of the President, H.R.H. The Duke of Connaught, have awarded the Albert Medal for 1936 to the Earl of Derby, K.G., "for the advancement of Commerce and Arts, especially in Lancashire."

Lord Derby's great services in promoting the trade and commerce of the country, especially in the North of England, are well known. For some years Lord Derby has been the active President of the British Textiles Exhibition of the British Industries Fair. He is also President of the Lancashire Industrial Development Council, the Liverpool Chamber of Commerce and the British Cotton Growing Association. He is also Patron and takes an active part in the work of the British Colour Council, and as President of the Travel and Industrial Development Association of Great Britain and Ireland he has done much to bring to the attention of foreign countries the attractions which this country has to offer, both for holidays and business.

The Albert Medal was instituted in 1863 as a memorial of H.R.H. the Prince Consort, for eighteen years President of the Royal Society of Arts, and is awarded for "distinguished merit in promoting Arts, Manufactures and Commerce."

"*PROBLEMS OF ROAD RESEARCH*"

Reports of Dr. Reginald E. Stradling's recent course of Cantor Lectures on "Problems of Road Research" are now ready in pamphlet form and may be obtained on application to the Secretary, price 2*s*. 6*d*.

PROCEEDINGS OF THE SOCIETY

SIXTEENTH ORDINARY MEETING

WEDNESDAY, 18TH MARCH, 1936

TRUEMAN WOOD LECTURE

COLONEL SIR HENRY MCMAHON, G.C.M.G., G.C.V.O., K.C.I.E., C.S.I., Chairman of the Council of the Society, in the Chair

THE CHAIRMAN, in introducing the lecturer, said: We have come here to-night to listen to what we term the Trueman Wood Lecture. It is one of our most important lectures of the year, and was instituted in commemoration of Sir Henry Trueman Wood, who was Secretary of this Society for some thirty-eight years, and afterwards became its Chairman. We regard this lecture as one of great importance, and we always endeavour to obtain as the speaker at this annual function some distinguished man who is master of his subject, whatever that subject may happen to be. To-night the subject that has been chosen is music, and I think you can congratulate the Society in its choice of the lecturer. Sir Walford Davies needs no introduction from me, and when I tell you he is Master of the King's Musick, you know that he is master of all music.

The following lecture was then delivered:—

ONE ASPECT OF ENGLISH MUSIC

By SIR WALFORD DAVIES, C.V.O., O.B.E., Mus.Doc., LL.D.

Master of the King's Musick

I—INTRODUCTORY

The subject originally given me for this Lecture—"English Music"—invited survey of an area which I knew to be quite beyond my knowledge; in such a vast tract I could only have offered you the untrustworthy guidance of a well-meaning fellow-traveller. But the revised and more-limited title allows me to hope that I may offer relevant help, however slight, in surveying one part of the ground.

Many of you will perhaps, at no distant date, see and master English musical ways far more clearly and thoroughly than is possible at the moment. Long-distance listening is, musically speaking, the most epoch-making event that has ever befallen music. It is bound to speed up musical interest and discernment beyond all previous experience. Within ten years, things may have become clear which otherwise would have taken a century to dawn on the mind of man. For we can now scan by means of a good radio-set the whole musical firmament, evening by evening, provided we have learnt how to focus this new kind of telescope to our ears, as we focus the other kind to our eyes; provided also that the Corporation's choice of music and our powers of discrimination are adequate. What is the

situation to-day, as compared with that of a decade back? Though it must be admitted that there is prevalent at the moment much depressing broadcast evidence of a debased taste for senseless music sensationally rendered, there is also a strikingly healthy and rising tide of musical understanding and taste for the art itself, as apart from its associated uses. You may safely picture millions listening nightly; among these, tens of thousands are doubtless listening with ever-increasing critical discernment; and among these again, hundreds of young listeners of outstanding musical sensitivity are listening creatively (including, maybe, a genius or two), feasting on the good things, but mentally vowing never when their chance comes to afflict the world with the banalities that are still so frequently heard. Public taste must needs go up and up, as well as down and down to the nether regions of deadly unthinking iteration. And if I may here be pardoned a violent analogy, even decay makes for good fertilizing.

Here we are, then, discussing English music in a new age of hope for music. Possibly some enlightened foreigner, should he but take the pains, may shortly (and with much more confidence than you or I) describe the present characteristics of English music, as compared with all other music. It is the outsider who sees most of the game. I met an Admiral the other day who had been in the Battle of Jutland. When asked to tell about it "I saw absolutely nothing of it," was the gist of his reply. Yet he had played, as I understood, a central and important part in it!

Still, we must try for ourselves to think over our own music together to-night, both analytically and enquiringly.

II—DISTINCTIONS

Let us first realise what we mean by English music, as distinct, for example, from Russian, French or German music.

I expect, as listeners, we roughly differentiate the various nationalities in music by general impression rather than by any details of melodic or harmonic pattern; by uses of mass and colour and by rhythmic behaviour rather than by the bend or turn of the composer's melodic lines or chords. In this general way I have been surprised to hear a person, self-styled as being musically ignorant, exclaim while listening-in, "That's Debussy, isn't it?" when not only was the guess correct, but when the composer was being (as I imagined) very faithfully *French* in his elusive orchestral ways. And let me remind you here that national characteristics thus recognized may easily get mixed up. There are, for example, pages of Delius—who happened, by the way, to live for years in France—which might orchestrally be called French; indeed, let me add (for what it may be worth as honest evidence) that I for one detect little in Delius's musical quality to make me exclaim "How English!" His music is perhaps both too cosmopolitan and too individual to be styled national at all. But it is a reasonable hope that in time, if slowly, he may by influence through the music of many young successors, in whom admiration transmutes into creative emulation, reveal some of the bloom and tang of

our beloved English countryside potential in parts of his exquisitely delicate orchestration. It is early days to be sure of this. And, in any case, music is so young an art, and so little understood as yet by any of us, that vast differentiations of individual and national kinds have yet to be realized which have so far hardly been suspected. But leaving these speculative vastnesses alone—leaving mainly alone another vast field also, that of national *dance-rhythms* acting and inter-acting upon national music; restricting ourselves for severely practical reasons to one single chosen aspect, the melodic—let us try to define for ourselves *English Melody*.

Certain qualities make us exclaim of a tune, "How very English!" We are now dissecting our own melodic anatomy without an anæsthetic. As Wordsworth exclaimed: "We murder to dissect." Yes; but he also exclaims: "Let Nature be our Teacher."

In the effort to define, we shall at once discover how hard it is to dissociate English melody from every other kind of melody. We cannot even define melody itself as we define language. I wish we could, but the two are not on a par, since a precise *phrase* of notes is much more elusive than a precise *sentence* of words. A tonal phrase such as this:

is a good musical analogue of a verbal phrase such as "The garden is gay." But a Russian might have written the tonal phrase, while only an Englishman would speak the verbal. Here lies one of our difficulties.

English *Utterance*, if we had such an expression in common use, would give us a better parallel than English *Language* to work upon. The way in which an Englishman "utters" himself; the sum total of the way in which he speaks, chooses his words, gesticulates, emphasises them, &c., &c., these indices to character would be more likely to resemble his musical ways and give more decided clues to their style, than the shape of his words, his nouns, verbs and adjectives.

But even here, we should not be on very secure ground for our melodic enquiry. It may be we shall find good English melody (provokingly enough from the purely musical angle) to be a department, so to speak, of good English manners. A man's ways of uttering himself—almost synonymous with his manners—are, I suppose, determined by *character* and *custom*; by his own character, and by surrounding custom to which he will inevitably react daily. A natural man anywhere has his own nature's manners qualified by natural processes of imitation and unconscious repetition of the manners practised round about him. On this account we find, for example, characteristic *English Ways* and characteristic *Russian Ways* must differ from one another; amongst them will differ the ways of English and Russian melody respectively.

Here we must note that the very differences will be fraught with fundamental human likenesses. Musical likenesses are very strong; both melody and harmony

everywhere work within the so-called octaves, fifths and fourths; and a man's melodic reactions to circumstances, whoever and wherever he is, are so humanly alike the world over, that peculiarites and differences may easily be stressed as national where they may prove to be but isolated examples of a world-wide impulse. Styles of melody, for instance, may to-night be ignorantly described by me as peculiarly English melodic styles (I hope not), when they may as naturally occur, without our knowledge, in other countries—Finland or Timbuctoo. *We* happen only to know them in England.

This fact, however, need not daunt us in our search. Well-marked national characteristics in music are plentiful and indubitable. It simply means that we must beware of claiming anything for *national* that is merely *natural*, anything for English that is just human! The instances of men doing this seem legion in all departments of life, and will crowd into the mind, if one begins to think of them. I was once sitting out of doors with a glorious old Englishman, ninety years of age, when he exclaimed, "Look at those beautiful *English clouds!*" (At best his expression can only be excused as being a description of natural cloud-formation frequently to be observed in England.) I saw an advertisement in Wales the other day, of "pure Welsh honey." Do bees, then, hum in Welsh, or do they suck a special Welsh honeysuckle in order to make this "Welsh honey"? Here, again, at best, it is honey sucked by a few of God's insects frequenting Wales, from flowers happening to grow in Wales or just over the border! And if we try to define pure English music as music culled in England, from a musical or audible "bouquet" heard in England, perhaps by an English boy with an urge to compose, we may possibly still get a very foreign distillation through a sensitive mind and (passing for English) a very mixed result will be labelled *English music*. No, English music is no more definable as "music made in England," than is church music as "music made in church." We must search deeper to distinguish between music that merely illustrates characteristically *human* ways, and music that behaves in characteristically *English-human* ways. Here I must mention, by way of warning and dismissal, the amusingly arrogant nationalism which turns a universal good into a patriotic commodity. When the old Scot, friend of Burns, said that you have only to play on the black notes of the keyboard, in an orderly way, to produce "a true Scots air," he was almost as arrogant as the ex-Kaiser in his famous utterance about "unser guter alter Deutscher Gott."

But before we look into the laudable Scottish claim to the black-note scale as being peculiarly theirs, and (as I hope) find a practical jumping-off point there for all nationals, let us picture one of the simplest examples of national-natural utterances for comparison, in the hope that it may help to start our minds fairly on to-night's enquiry. Imagine a Frenchman, a German and an Englishman each wanting to utter a decisive affirmative. They do not all say "Yes." Neither do they all say "Ja" or "Oui." But they all nod their heads; they could not indicate "yes" by shaking them. They show their difference in nationality by their language—*Oui! Ja! Yes!* They show their human-natural affinity by the

common gesture, their nod of the head. But, *lying beyond these two ways*, less definite than language, less conventional than a nod, and more character-betraying than either, is their manner of stress—what we may call their " music in the rough." Imagining great emphasis to be necessary, we can almost hear how each nationality might further show its true difference of character. Merely surmising what I personally consider to be typical (it may be all wrong, of course), let me put it in *quasi*-musical form :

The Frenchman :

The German :

The Englishman :

Whether the above are in themselves good guesses, and approximately likely or not, is beside the mark for the moment, if only we can establish this two-fold starting point for our enquiry :

(1) That, as nations (through character, choice and custom) not only acquire their own languages, but their own manner of uttering those languages, so national music (deriving also from character, choice and custom) is closely related both to a nation's language and to national manners of utterance (including gesture, emphasis, use of reiteration, etc.).

(2) That in all countries alike, music retains general melodic and harmonious qualities which are, so to speak, super-national, *i.e.*, common to all music-loving humanity.

Having in mind this double starting-point, and admitting no guess at the nature of English melody, much less any conclusion about it that for a moment forgets or ignores either clause, we may now aim at a few discoveries. But may I add they will be of a very unsensational order ; so unsensational, indeed, that I cannot but wonder whether I do right to detain the Royal Society of Arts for a whole hour over such slight results.

III—Super-National Factors

Let us first decide, if we can, the main attributes of melody which the musical world holds in common, in order to clear the ground for our chief point. In all national melody we may at once generalize and say that everything vital to a melody's very existence is super-national. Think of the two most extremely different men you possibly can, one highly civilized, the other aboriginal ; set them side by side in your mind. National characteristics are all most marked in them. But in all that is *vital*, all that means life and death to them, they are alike—they both stand upright, both breathe regularly, their hearts beat to live ; when tired, they droop and sleep ; move animatedly when full of energy, and in sundry like

related ways betray their respective degrees of energy, zeal, emphasis, etc. In just the same way it is true to say that the most extremely contrasted melodies among the nations of the world have vital similarities. For a real tune also lives and breathes (*i.e.*, is rhythmic) ; a real tune rises and sinks to rest (*i.e.*, makes signs we call climaxes and cadences), and in a beautiful sense a tune has limbs and stands upright.

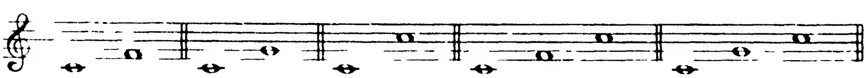
Escaping from generalities let us now note two of the specific ways in which all tunes (of all nations) are vitally alike. There are doubtless far more than two ways ; but two seem universal and all-important, and we shall find it a help to lay them down here as axiomatic :—

(a) every tune has perceptible balance of phrases—balanced " limbs " ; and
(b) in every tune tones are perceptibly related within one or more of the natural relations known as octave, fifth and fourth.

We may not too fancifully say that a tune of well-balanced phrases has a body that stands upright ; and a tune that builds on octaves, fourths and fifths has a clear mind.

Tunes possessing these two attributes, come they from the ends of the earth, are neither more nor less intelligible to us all than is any stranger who walks as we do, breathes as we do, *and has a mind able to say " yes " (as we can), when two or more facts tally, and able to take knowledge when they differ.*

The mental equipment implied above is, musically speaking, primitive in the extreme. It means little more than the power to remember hearingly and the power to recognise instantly by ear three tonal relations ; the so-called octave, fifth and fourth, as from any given tone C :



(Here the sub-division of the melodic octave was illustrated by lantern slides.)

It must be admitted that the faculty of aural memory is one that we are expected at present to cultivate for ourselves and is, indeed, deplorably left to chance from childhood onward. It is not included in the *curricula* of primary or secondary schools yet. Let us hope it will be before very long. It must also be agreed that the neglect of the simplest musical education is still amazing. And, in view of this fact, together with the difficulty of attaining a musical memory, it seems likely that thousands of adults who modestly say : " I am not musical, but I love music," could far more correctly say : " I should be musical if only my aural memory were in good order." Is it not probable that normal man everywhere is musical to the extent of knowing and enjoying a tune that is to his mind, so long as his mind holds it ? It is intensely interesting to watch the increasing volume, coming from every country, of melodic evidence to the unanimous human acceptability and use of the five-note scale which contains no false fifth, no augmented fourth, and which easily and beautifully regularises every wayward rise and fall of

voice or instrument all the world over. (*Illustrations were cited.*) The potent influence of the perfect fourth has carried us much further in the West. Our equally divided octave, as stabilised in Bach's tempered semitonic scale, offers measureless material for future melodising in unheard-of ways, giving scope for every " nation, language and tongue " to develop its own idiosyncrasies in a way intelligible to the educated mind everywhere,* and in ways as yet unlearned by man. But here, for the moment, let us hold to our Scots friend's " black-note scale " as an obvious world-wide melodic starting-point ; and, with that in mind, note and admit the next natural step forward, leading us to the so-called natural or seven-note scale. For, up to the present, it is *the palpable and proved basis of all English melody.* Indeed, in tracing our national melodic taste it would seem necessary to go a point further ; because the evidence from early English times and tunes down to the very latest national melody penned only the other day points to a prevailing English predilection for one form of the natural scale, the once-called *Ionian* form or common major scale.

Hearing an aeroplane engine, the other day, pass slowly through its accelerating tones in flight, I was rather annoyed to find that, to my unthinking mind, it played this major scale :

My mind, putting no reason to work, heard these definite stations as though the pilot had stayed his engine a moment at each of seven stations before continuing acceleration. I was not actively picking out these particular stations. It was the unconscious result of sixty years musical experience ; it was the *surface* result. After looking through a mass of English melody popular since earliest times, and watching its ways, I conclude that the major scale is similarly quite unconsciously paramount in the mind of nine out of ten Englishmen to-day. Not to the exclusion of the minor ; nor to the exclusion of chromatic or semi-chromatic concepts ; but preponderantly present as an unconscious controlling factor in us all, with a taste for the deeper pentatonic roots controlling the controller. We are not a chromatic race as yet.

But now let us listen into and examine various examples of English melody. We shall find there are two outstanding attributes which constantly recur :—

(1) English tunes seem to use the natural scale *monosyllabically*.

(2) They move from point to point (or from tonal monosyllable to monosyllable) with forthright directness, and as a rule with little or no ornament.

Let us examine these points.

* Recent evidence of the almost dangerous readiness with which Western harmonic music is assimilated by other races is surprisingly general.

IV—Monosyllabic Melody

The melodic quality here styled *monosyllabic* needs explanation. The term has not for choice but perforce been borrowed from language. That which makes for monosyllabic speech makes also for monosyllabic melody; and it would be a pity to restrict our thoughts of this attribute to the English language. To imply that music merely took the monosyllabic habit from language would probably be gravely misleading. It seems truer far to say that both language and melody took this attribute from something in the English race itself. For this reason it seems best to consider this part of our subject and its companion-part, the element of directness (whether melodic or linguistic), as abstract questions first, and keep the fascinating question of the interrelations of language and melody, and their intimate reactions upon each other, till the end.

The most monosyllabic English phrases I can cite are the last two of the tune called St. Anne :—

or the first of the refrain in The Vicar of Bray :—

It will help if we at once contrast this with a phrase or two of a typical German tune :—

where some of the musical " words " may be described as trisyllabic, and two perhaps as even pentasyllabic !

Anyone sufficiently keen to go through a few hundred English tunes, old and new, will be astonished at the prevalence of the monosyllabic habit in our melody. Of course there are plenty of examples of florid and graceful melodic polysyllables, as there are monosyllables in plenty in the melody of even the most ornate national styles such as many of those further East. But whether you search as far back as Dunstable and Fayrfax, or in famous early fragments such as " Sumer is i-cumen in," or in the splendidly illuminating Folk-Song Journals, or in Chappell's " Music of the Olden Time," or any more up-to-date collections of national melodies, you will find the monosyllabic feature everywhere. [*Examples quoted here included Hubert Parry's " England," Elgar's " Land of Hope and Glory," Quilter's " Non Nobis Domine," Vaughan Williams' " Linden Lea," and phrases from other tunes.*]

I should like at this point to show you three notable English cadence-phrases, one from *Parthenia* (Elizabethan), one from Parry's " Jerusalem," and one from

a work just written by Vaughan Williams to commemorate King George's death. I will reduce the three to the key of C for purposes of comparison :

This monosyllabic habit seems at root a habit of mind, a habit of *going to the point*, as we say, and unconsciously of *making the point;* the *point* being the establishing of the *chief related notes* of whatever mode or scale the melodist is ranging at the moment. One natural result of this is a tendency to exclude or curtail grace-notes, turns, and all chromaticisms. This, of course, is done unconsciously and often rapturously—the effect is all the more certain and clear for that. It is not as though an English melodist ever seems to say, " I'll now give you your *bearings*." Not in the least. But he does often melodically seem to say : " *That's* THAT," and to say it with downright gusto. In this favourite manner he sometimes gives point to the Pentatone itself, as in this old refrain of the London Waits :

Or, with just such strength and directness, he will set forth our *Dorian* bearings as in *Agincourt :*

Examples of this blunt clarity in our own ordinary major scale are simply legion, and must be in the back of all your minds.

For purposes of this lecture, I have prepared a great many more tunes than we can possibly play or sing to you, and they all have some special corroborative interest. I think the best plan at the moment is to offer you, side by side, eight of the many tunes that have grown into the musical lingo of England in a particular and favourite form, as shown in the famous tune " Barbara Allen." They vary greatly in detail and in mood. But in their monosyllabic style they are eloquently constant :

If all these be carefully analysed, it will easily be seen that the monosyllabic feature occurs at points in the tune where the sinew or bone-matter is to be found. Not that our English melody deserves to be called bony. It sometimes may. I would rather call it sinewy. Our tunes have good *biceps* to them. Strength rather than grace is the consequent characteristic. An extreme case may be found on p. 208 of the 4th volume of the British Folk-Song Journal, in a tune which begins :—

V—Conjunct Movement

For verification of the second notable attribute of English melody already suggested, namely, its directness, we shall, I think, do best to listen for the numberless examples of conjunct or scale phrases in our typical tunes. When once we have descried the habitual monosyllabic emphasis on the chief notes of the tunes, or of the harmonic thoughts behind the tunes, it is easy to trace the chief symptom of directness in the ever-recurring scale passages. Look at Morley's " It was a lover " :—

Or look at " All in a garden green " :—

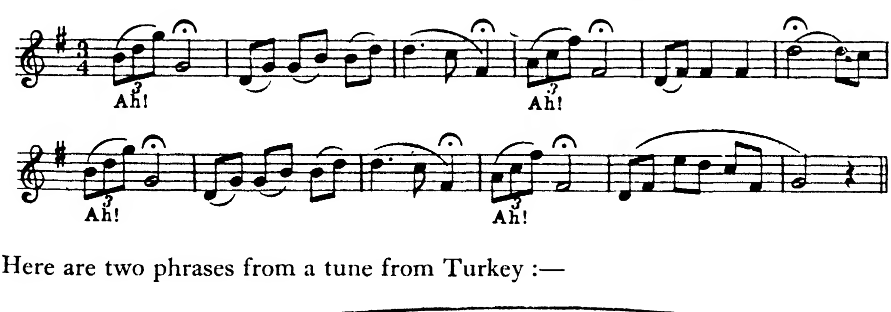
Or this fragment, " Then to the Maypole " :—

Or this tune : " I'll tell thee, Dick " :—

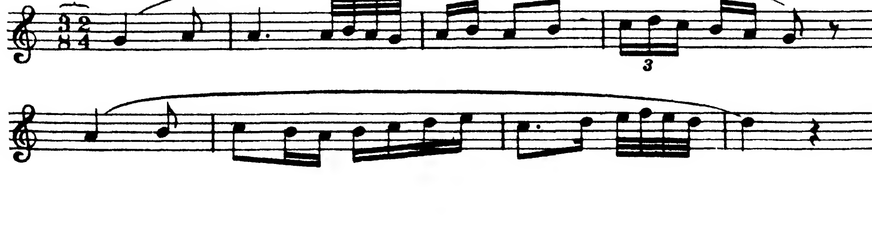
For an example of the alternation of these our two attributes in one tune, we could perhaps hardly find a better than this, called " The Happy Clown " :—

VI—Comparisons

In order to realize the far-reaching nature of our two characteristics, it will be well to divert to examples (they can only be very few and fragmentary) of other kinds of melodies or phrases from melodies, which by comparison strike the ear and mind at once as *not* English. Here is a line from Upper Austria :—



Here are two phrases from a tune from Turkey :—



Here again is a Magyar tune :—

Here a Bohemian :—

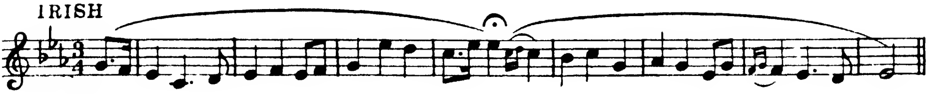
The following phrase from a Norwegian tune (in spite of English affinities apparent in the rest of the tune) would make us say " That is *not* English " :—

This French-Canadian fragment would certainly surprise us if picked up, say, in Devonshire :—

In such examples as these, we may by careful, comparative listening gain two possibly important impressions how little of *musical patterning* for its own sake, whether rhythmic, melodic or harmonic, there is in England ; and also how seldom (by comparison with other countries) an emotional rise is made, as it were, for its own sake. Of eventful rise and fall there is, of course plenty ; but, taken as a whole, there is in it a general pervasive equability that seems to eschew any marked demonstration of feeling. An occasional exception seems to me

to prove this rule. The following three phrases are not surprising, coming from Ireland, Scotland and Wales respectively :—

IRISH



SCOTTISH

WELSH

But one finds in more ways than one, something exceptional in this English folk-song " A sweet country life " :—

ENGLISH

After the first line we seem to say goodbye to the English characteristics, though they reappear (and even somewhat clumsily) in the last line's leaping parts.

VII—The Interaction of Poetry and Music

We must now turn, all too briefly, to examine the fascinating relation of our own language with our own melodising. To realize the immensely potent influence of England's language upon its melodies, one need only recite to oneself any typical fragments of metrical lines of English. Take a few at random :—

" They hand in hand with wandering steps and slow
" Through Eden took their solitarie way."

In addition to the monosyllabic thuds of thought and of feeling, how subtle and yet how inescapable are the varied *quantities* and *accents* as factors in the total musical effect of this communication ! Analyse its effect in a few of its details : the word " hand " cannot be made short ; " steps," on the contrary, cannot be made long ; " slow " must be lingering ; " solitarie " must be a group of four shorts, and so " way " must naturally be long. The fact that such lines of typical English end with so decisive a monosyllabic accent well may have terrific influence upon English tunes and melodious phrases. Glancing at a page of Milton (lying

open before me as I write this) I find there is not a single exception to this monosyllabic pull-up of each line. Is it not likely that the same symptom should appear in extended melody ?

Listen, again, to Coleridge :—

" Ah ! from the soul itself must issue forth
" A light, a glory, a fair luminous cloud
" Enveloping the Earth—
" And from the soul itself must there be sent
" A sweet and potent voice, of its own birth,
" Of all sweet sounds the life and element ! "

Or to Shakespeare :—

" A lover's eyes will gaze an Eagle blind.
" A lover's ear will hear the lowest sound."

There is the same forthright quality here, of going straight to the heart of things in the delightful balance of a couple of monosyllables, a quality that is no mere attribute of the English language. The taste for this quality of forthrightness, abruptness, unadorned directness of expression—call it a thousand different names —is in the English race, in its attitude to life ; and it seems less true to say that a language that so uses monosyllables makes our music monosyllabic to match, than to say the English character compels both our speech and music to the point in this direct way.

We are at the present time spelling out anew the deeper relations of English speech and English melody. We are driven more closely than ever to it by new necessities and by the new and pressing contingencies of broadcasting. Composers and singers alike find themselves face to face not only with a newly discerning and critical public regard, but with new possibilities which will need a new technique. The ground where speech and song merge, long known to babes, long disregarded by the musically sophisticated, is at last being perforce and respectfully explored by the wise and prudent. The very lengths and colours of at least fifteen English vowels are being explored ; speech-rhythms and speech inflections are less light-heartedly violated in musical setting. Genius has long known how to wield them, or rather how to let them wield music.

" The Messiah," written in England for English consumption, by a German composer* with an Italian educational bias, should (and I think, does) afford most telling indications of the way in which English language can inspire English music with pervasive downrightness and straightforwardness of utterance. Glance at a few instances. No one would, I fancy, suggest that the genial roulades in " For unto us " are anything but warmly and ornately Italian. (*Example was quoted.*) Nor could one claim anything particularly English in the next theme. (" *And the government shall be upon His shoulder.*") It might be the musical utterance of almost any European, trained perhaps in Italy. But then, arising like some

* Or, as Tovey playfully styled him in the Encyclopædia Britannica : *Handel (Georg Frederick)* " an English composer of German extraction."

Gibraltar out of a blue Mediterranean, we hear the bare rock-like utterance in music which is wholly after an idealist Englishman's heart and mind (*the musical setting of the words : " Wonderful ! Counsellor ! the mighty God ! the Everlasting Father ! the Prince of Peace " ! here was illustrated*). There is a reflection of stark glorious reality in this ; and it should be noticed that Handel is incapable of " Italianising " any syllable of these words at any point of the elaborate chorus as it proceeds. The interjections always arise unadorned, above the general stream of choral and orchestral energies. And it is unthinkable that anything other than this unequivocal burst of sincerity has given this particular chorus its great popularity and its perennial thrill to all English audiences. Again, the first five chords of " Comfort ye " (*illustrated*) ; the first scalewise rise and fall of the Pastoral Symphony (*illustrated*) ; the phrases set to the words " For the Lord God omnipotent reigneth, And He shall reign for ever and ever " (*illustrated*) ; and all the plain architectural " Hallelujahs "—these and many like examples afford striking evidence of the same characteristics ; and perhaps most illumination of all may be found in the nature and treatment of the following immortal phrase :—

as compared with Bach's contemporary setting of the identical words :—

A glance of the ear (or the eye for that matter at its mere look on the page) will convince the hearer that in the Handel setting there is a quality of bare musical statement that would not be in place in the Bach aria, any more than a phrase of blunt English speech could match a polished French, fluent German, or suave Italian phrase. The purely musical distance between Bach and Handel is not great. They were close akin in fundamental ways. That is a valuable part of the comparison. Handel was perfectly capable of going forward in this very aria with phrases like those of Bach ; and Bach could, on occasion, be as strongly monosyllabic or conjunct in his phrases as Handel or Purcell—as he is, for example, in the final chorus of " Ich hatte viel Bekuemmerniss " and many another. But the unadorned, matter-of-fact idealism of this undying Handel phrase seems uniquely to exemplify the way, congenial to England, of uttering such a universal human cry of faith as this. And the result is truly *English music*.

VIII—Conclusion

To sum up : we find English melody, generally speaking, is apt to put the point of its phrases monosyllabically, and to go as straight from point to point as is possible. This means that patternings, emotional lingerings, grace-notes, turns,

roulades—ornamental tones generally—are not typical. They are constantly present. They may come in, like strangers from abroad—as from Paris at the Restoration; or through violinistic visitors from Italy—Geminiani or, later, Paginini; or with guests from Hungary, as with Joachim, so beloved of England. They can be assimilated and become second nature. Emulation may evoke them. They may be innate and submerged. But the quality of forthrightness (or downrightness, or uprightness, if you will) remains in the English tune supreme and seems most clearly demonstrated by the two ways described above, the monosyllabic way and the way of coursing through the whole diatonic scale for fun, as it were.

Was it not Wagner who remarked that the first phrase of "Rule, Britannia" summed up the British character?

He was surely very near the truth. Indeed, if one had to reduce all that can be said of English melody into one example and one sentence, this would perhaps be the example, coupled with the summary statement that English melody is *monosyllabic* and *forthright.* I imagine any good business meeting in this august city of London might well begin with the first eight notes of "Rule, Britannia," (just quoted), and end with Handel's typical cadence:—

Or, to see our two characteristics at a glance, look at these two versions of the last line of the National Anthem:—

Both are true to type, perhaps the first more so.

I hardly think we can do better in conclusion than to look together into extracts from a work (published by Macmillan at the turn of the century) of which the words and music were a special national effort made, at the instigation of Sir Walter Parratt in honour of Queen Victoria's long reign, by a group of leading poets and composers then living. By comparing several typical phrases from these—especially the initial phrases of each composer—by collating them, we not only get to-day's confirmation of our guesses, but we can almost imagine them all as the work of one man, so alike are they in certain essential particulars; and that one man seems like a very familiar contemporary. Even Elgar's 1900 themes might have been written by Hubert Parry in 1880, except that those who know Elgar's

subsequent work well can detect a peculiarly intimate ruminative stress on the perfect fourth which transpired to have been in a special sense his. (*Seven examples were cited from " Choral Songs in Honour of Queen Victoria."*)

The " English School " of composition of some twenty years ago was the admirable outward sign of an inward musical grace. It was an awakening that has borne rich fruit. As one of its disciples put it to me at the time, " We refuse musically to talk broken German." So some tonic-and-dominant-shackled hands were freed. But I remember one modest lover of the classics being taunted with " You're one of the *universal language* johnnies ! " This taunt induced a healthy reaction at a period, musically speaking, of " ready-mades." It was a time when a good voice could persuade undiscerning audiences to applaud words however " misfittingly " dressed in musical garments worthy only of a guy.

We were rebellious against such a conception of art as could cause one poet at the end of the nineteenth century to exclaim : " My heart is second-hand ! " Yet our taunters have found that the most English composers remain " universal language " johnnies ; that is, if their hearts are in the right place.

No—having once looked diligently and critically into English characteristics, I fancy he is wise who hastens to forget them.

Self-conscious nationalism in music is an appalling thing. Perhaps it is even true that he that loveth his nationality shall lose it. And certainly a normal Englishman no more says : " I am about to write English music " than a normal gentleman says : " I am about to be a gentleman." He cannot possibly help being one.

I suppose music is at long last just creative wonderment made audible. In it we dwell on the things that surround us—on matters of life and death as they affect us. It is the loving language of a man's mind as he ponders realities. So an English composer looking out of an English window into God's Universe with an ordinary artist's wonderment can only add a note or two to the sum of man's music. If he is recklessly sincere, and felicitous, it will incidentally be an English note, upon which perchance your and my successors here may spend a pleasant hour's study together in this room of yours, a few years hence.

THE CHAIRMAN said : I feel somewhat embarrassed as to how to express adequately our deep appreciation of what we have just heard. When introducing Sir Walford to you I spoke of him as a master of music ; but he has shown himself not only a master of music, but a master of speech and delivery. I might also call him a master of jugglery from the skill with which he has mixed up speech and music all the evening. He has given us a great treat—not only an intellectual treat and a musical treat, but an educational treat, too, and I think many of us have learned to-night a great deal more about music in general and English music in particular than we ever dreamed of.

In judging the merits and interest of a lecture I know of no better test than that of time. Sir Walford's paper, judged by time, has been a long one, but our complaint is that it was much too short. We would have liked to hear him speak longer, play more and sing more. May I take this opportunity of also saying how much we enjoyed the vocal accompaniments of Mr. Norman Stone.

I know that you will all join with me in moving a very hearty vote of thanks to one of the best speakers and lecturers that we have ever heard in this hall.

DR. GEORGE AITKEN, D.Mus., in seconding the vote of thanks, said : It was only when I got into the hall that I was asked to support the vote of thanks, and I really do not know what to say, there being so much that could be said. I have a great admiration for the lecturer as a man and a musician. We all admire his lucid and simple manner, and everything that he says he puts in such a clear way that you cannot fail to understand it. I know he hates being talked about and hates applause, for himself, that is, though he seems to think singers have a right to it. We have heard how well he sings, so I ask you to applaud him, if not as a lecturer, then as a singer—in good English fashion. Mr. Norman Stone certainly must be applauded for his own delightful singing.

The vote of thanks was carried unanimously, and the meeting terminated.

CORRESPONDENCE

" A HANDBOOK OF COLOUR "

I was rather surprised to read some of the comments of your critic on the book *A Handbook of Colour*, reviewed in your *Journal* on April 3rd. It rather makes one wonder if the book had been read with sufficient understanding.

To refer to the passage, " But to the colourist . . . modify a pure hue." Surely your critic should know that the 24-colour circle and the structure representing the complete range of Ostwald's standardized colours are no more than skeletons of a possible whole, and if a given " tertiary " is not in the " bones," as it were, it is nevertheless present between them. " The infinite variety of those neutral tones known as tertiaries " can be measured in terms of black, white and pure colour and may be matched by Ostwald's method more easily than by the mixture of two or more pure colours. The imperfection of pigments will, of course, handicap the matching process whatever method is used.

In the passage, " This admission of achromatic . . . adulterated with black," I am afraid I can see little excuse for the confusion of " the rich depth of a saturated colour " (what I should call purity or intensity of hue) and the " dark value of a colour adulterated with black " (what I should call the darkness or low luminosity of a shade). I should say that such confusion would be entirely impossible in a person familiar with the various single-hued or monochromatic triangles.

Take also the passage which reads " Again in a system . . . advocates of the system." Three colours in the circle of 24 are very definitely red colours : this is one-eighth of the whole circle—surely enough to disallow the " visual defect " accusation. The retention of only three standard reds does not prevent us from mixing as many reds as we can distinguish from each other.

In answer to the passage, " It is unfortunate . . . spectrum range," I must say that I do not regret the elimination of the term " violet " any more than the elimination of the other Newtonian term " indigo." Indeed, if it serves to emphasize the fact that the pure colour circle is a psychologically arranged circle of pure colours and not a spectrum, it will be a very excellent thing. In addition I would add that

if the critic compares the purple about which she complains with the flower " violet " she would find it to be quite different, and much more red.

I hope you will excuse this letter, but in fairness to the author, I did not feel that I could let your critic's criticism pass without comment.

W. E. WILLDAY.

The letter of protest to the Society from your correspondent, Mr. W. E. Willday, on the subject of my critical attitude towards the Ostwald teaching of colour, gives me an opportunity of further expressing the views of a practical colourist on this subject. He rightly interprets my strictures as bearing solely on the theory itself, quite apart from the value of the *Handbook*.

In reply to objection (1) to the passage beginning " But to the colourist . . . modify," the assumption of the skeleton nature of the colour diagram goes without saying, being implied in the term " diagram." An infinite number of intermediate hues between the actual 8, 12, 24, etc., areas represented allows of any tertiary being produced, but they are made no use of in Ostwald's scheme of things. His neutrals, or impure colours, are classified according to whether (*a*) a hue is mixed with a white, (*b*) a black, or (*c*) with both pigments ; the first two cases being distinguished as *clear*, and the third one as *muddy*, colours. Both letterpress and illustrations stress this method of obtaining neutrals ; the distinction between tertiaries, arising from pure hue mixture, and the broken tints, due to adulteration of a hue with black or white achromatic factors, is ignored. Yet the difference is essential to the painter.

(2) Allied to the foregoing is the objection to the passage " this admission of achromatic . . . etc." White and black are not " colour " in the meaning of chromatic *sensation ;* they are only so in the sense of being *pigments*. As sensation they are achromatic, *i.e.*, undistinguished by a characteristic wave-length, or some determined combination of definite wave-lengths. Hence their variation is measured by the degree in the force of illumination. When dealing with pigments, that force is represented by the amount of black or white added to the pure hue which serves as colouring matter. Ostwald's ingenious diagrammatic method of obtaining the degree of visual response to gradation in achromatic stimulus would naturally lead him to fall back on this method of getting any tone-value in the neutral series ; particularly as his instructions were primarily intended for painting on a very coarse scale. As a training in colour discrimination, however, it runs counter to all the colourist's instincts, which distinguish so fundamentally between the " darkness " of blackened hues and the " depth " of fully saturated ones. " Imperfection of pigments " is not here the question, and his coloured diagrams corroborate the text

(3) In regard to the balance of hue areas in Ostwald's chromatic circle, your correspondent, noting that " three colours in the circle 24 are very definitely red " assumes equal balance between the 8 different members. But in fact Ostwald's nomenclature divides the range into 6, not 8, specific hues ; namely 1 red, 1 orange, 1 yellow, 2 greens (*kalt-grün* and *warm-grün*), 2 blues (*eis-blau* and *korn-blau*) and 1 violet. The further subdivision of the series to 24 thus gives three areas to red as against six to green and blue, respectively. This preponderance of the two coldest colours is markedly out of keeping with the balance in a normal continuous spectrum. Ostwald starts his deepest-red round about vermilion at the thermal end of the spectral sequence, whereas the deep garnet hue of the Fraunhofer line A.80 is recognized as being visible to normal colour vision. It is this fact, coupled with the superabundance of the green area, which suggests a suspicion of defect to red in his vision.

(4) In respect of the comment on " violet," the final hue visible at the actinic end of the spectrum, there can be no question of its elimination ; my regret was that the German term *veil* should have been translated " purple," which belongs to the thermal end and hence to the red series. For Ostwald, of course, it would not exist, and it is unfortunate that his teaching, only recently launched in the form of an English translation, should have been adopted so hastily by educational authorities here. Colourists as a body have not had time to test its merits practically ; probably few have had the same chance as myself to study it for years in the original. That the result of this longer experience has been to find it both inadequate and misleading is no proof, as your correspondent suggests, that ignorance, or " lack of sufficient understanding " underlies my criticism.

M. Sargant-Florence.

NOTES ON BOOKS

The Technique of Still Life Painting in Oil Colours. By Leonard Richmond, R.O.I., R.B.A. London : Sir Isaac Pitman and Sons. 12*s.* 6*d.*

It is probably true that the aspirant oil painter should begin experiments in childhood unhampered by instruction and under no obligation to keep himself or his apparatus tidy and clean. If he has any talent he will in due course make quite sure of the direction it is his business to take. But there comes a moment when time is gained and nothing lost by availing oneself of the experience of others.

When this moment has in fact arrived, Mr. Richmond's book is likely to be a help. It teaches two things : method, and how to achieve certain effects. It does not follow that the learner will want to reproduce these effects, but not knowing is a cause of anxiety in art as in connection with the Facts of Life. If you don't feel sure you can paint a lifelike tin box with light reflecting on it, you get a kind of complex, which holds you up and makes you take longer about producing more interesting things. A good many artists to-day go in for a primitive, childlike style. This is very well, as far as it goes, but a finished technique has its own charms, its own pleasures.

The value of Mr. Richmond's book is that it has been most carefully illustrated in colour, with some close-ups the original size of the subjects, which make the method of laying on paint quite clear. The text is written with the greatest patience—as if for the benefit of the slowest member of the class. But this is a manner for which the quickest member is grateful in nine cases out of ten.

P. B.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

Monday, June 8..University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, **"Islamic Art."** (Lecture V.)

Tuesday, June 9 .Research Defence Society, at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 3 p.m. Sir M. Watson, **"Manson, Ross and Reed : Pioneers in Tropical Diseases."**

Rural Reconstruction Association, at the Chartered Surveyors' Institution, 12 Great George Street, S.W. 4.45 p.m. Major Dorman-Smith, **"The Revival of Agriculture."**

University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, **"Islamic Art."** (Lecture VI.)

Wednesday, June 10..University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, **"Later Byzantine Painting."** (Lecture I.)

Thursday, June 11..Chadwick Trust, at Chelsea Physic Garden, Swan Walk, S.W. 5 p.m. Sir W. Willcox, **"Plant Pharmacology and Medical Practice."**

Imperial Institute, South Kensington, S.W. 2.30 p.m. J. A. Gaunt, **"Hong Kong."**

University of London, at the Courtauld Institute of Art, Portman Square W. 5.30 p.m. Prof. T. Rice, **"Later Byzantine Painting."** (Lecture II.)

Friday, June 12..University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Prof. T. Rice, **"Later Byzantine Painting."** (Lecture III.)

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

NOTICE

ANNUAL GENERAL MEETING

The Council hereby give notice that the One-hundred-and-eighty-second Annual General Meeting, for the purpose of receiving the Council's Report and the Financial Statement for 1935, and for the election of officers, will be held, in accordance with the Bye-laws, on Wednesday, June 24th, at 4 p.m.

(By order of the Council),

WILLIAM PERRY,
Secretary.

PROCEEDINGS OF THE SOCIETY

SEVENTEENTH ORDINARY MEETING

WEDNESDAY, 25TH MARCH, 1936

THE RIGHT HON. LORD CLINTON, P.C., G.C.V.O., in the Chair

THE CHAIRMAN, in opening the meeting, said: I am quite certain that no very formal words are required in introducing Sir Roy Robinson to any audience which is interested in forestry. It has been our very good fortune, I think, that Sir Roy has devoted so much of his time to the science and practice of forestry. He himself was responsible to a very large extent for the formation of a forest policy for Great Britain, and he has through all his time shown that he is able to lead that policy in the direction in which it has gone, largely towards the extension and recreation of the forests in this country. As Chairman of the Forestry Commission now he is doing

a most admirable work in the extension of forests. It was through the Forestry Commission that the great idea of the Imperial Forestry Conferences evolved, and I am sure the result of these conferences has been of real advantage to the Empire itself. The experience gained there has taught us a very great deal about all the problems which affect forestry throughout the Empire, and has also given us a really good idea of the vast forestry resources which we possess.

I think that I may now ask Sir Roy to address you upon the subject which he himself is so very competent to speak about.

The following paper was then read :—

FORESTRY IN THE BRITISH EMPIRE

By Sir Roy Lister Robinson, O.B.E.
(*Chairman of the Forestry Commission*)

Area and Distribution of the Forests

The subject on which I have the honour to address you relates to almost one-fourth of the land area of the British Empire. In round figures the total area of forest is 2,500,000 square miles. The distribution by main political divisions is shown in Appendix I.

The total forest area may be divided into broadleaved forest 60 per cent. and conifers 40 per cent. The great bulk of the coniferous forest (over 90 per cent.) is in Canada ; the remainder is variously distributed in the Himalayas, in Australia and New Zealand, in South and East Africa and in Britain. If we except the eucalypt forests of Australia and the nothofagus forests of New Zealand, the broadleaved forests are predominantly tropical in character.

The bulk (over 90 per cent.) of the cheap timber used in industry is coniferous (or softwood), the broadleaved species (or hardwoods) being used chiefly for special purposes. Land transport of timber is costly, and it follows that the distribution of the two main sorts of timber is not such as to make the Empire economically self-supporting. For example, the greatest importer of timber—Great Britain—draws her supplies from forests which are readily accessible to water transport. That statement applies both to the softwoods of Northern Europe and Canada and to certain hardwoods, such as teak. The cost of transport is one of the main factors (though not the only factor) which reduces the total forest area of 2,500,000 square miles to possibly 1,200,000 square miles of merchantable forest.

Character of the Forests

The purpose of this paper is not to describe the forests of the Empire, but rather to give a brief account of the ways in which they are being treated. It is beyond the powers of any individual to know intimately such vast and varied areas, much less to describe them incidentally in a brief paper. I will refer in the appropriate places to some of the simpler types of forest, but the tropical forests cannot be dealt with in that way, so numerous are the kinds of trees and so complex and various the associations of vegetation. I propose, therefore, to present at once a very

generalised description (which will lay me open no doubt to severe criticism by botanists and foresters). In the tropics, soil and atmospheric moisture are of great importance. Starting from sea level it is not uncommon to encounter mangrove forests which are important in supplying firewood, poles and tan bark. The coastal plain may be swampy and sparsely wooded, but passing into hills we come to the great zones of "closed" forest in which the trees meet in complete canopy. A rough classification will divide this closed forest into evergreen or rain forest and deciduous forest. These are characterised by very numerous species, of which a few "primary" hardwoods are of first-class commercial importance while a number, as yet unproved, of "secondary" hardwoods are of potential importance. From the "closed" forests come, for example, the Spanish mahogany of British Honduras, the African mahoganies of West Africa, teak from Burma, greenheart from British Guiana and other highly-prized tropical hardwoods. Beyond the closed forests and where moisture is wanting lie the "open" or savannah forests. Apart from their timber and fuel wood resources, tropical forests provide for the native inhabitants great quantities of minor produce—thatch, fruits, gums, resins, and so on. The forests are often, too, the basis of primitive agriculture. The procedure is to cut and burn patches, cultivate with food crops for two or three years, and then pass on. This shifting cultivation is very destructive of forest. Foresters have sought with some success to control the damage by combining shifting cultivation with the replanting of the forest under the system of so-called *chena* or *taungya* plantations.

Ownership and Administration (General)

An account of forestry in the British Empire is necessarily an account of government activities. The great bulk of the forests belong to the Crown, and in any event forestry work is inherently of such a character that if Government does not take the lead nothing effective is done at all. The main exceptions to government activity are to be found on private estates in Great Britain, in the somewhat extensive pine-planting operations of afforestation companies in New Zealand and Australia, in the growing of wattles and mining timber by companies and individuals in South Africa, and in extensive farmers' wood-lots in Canada. Here and there, as in parts of Canada, commerical companies have paid a little attention to maintaining the forests which they exploit. Municipal ownership and management of forests exists also, but has never developed extensively, although communal and tribal ownership of forests is the rule in West Africa.

There are altogether some fifty separate forest services in the Empire and, although not everywhere is all the work which might legitimately fall to forest services concentrated in them, it is to these forest services which we must look for maintenance and improvement of the forests themselves.

In all these services there are some 1,500 officers with sufficient academic qualifications or experience to fit them for supervisory and administrative duties. On the basis of 1,200,000 square miles of merchantable forest each officer would be

responsible for the care of 800 square miles. The figure is a rough one, but it is accurate enough to indicate that, on the average, the intensity of management is very low indeed. The various services work for the most part independently, but apart from local liaisons there are certain agencies which work for Empire forestry as a whole. These are the Empire Forestry Conferences and their Standing Committee in London, the Empire Forestry Association and the Imperial Forestry Institute.

There have been four Empire Forestry Conferences since the War, and a great deal of information prepared on uniform lines has been brought to them. The discussions have covered all branches of forestry, but the most important have been those on forest policy. A determined attempt has been made to state, for the guidance of governments, the essential ingredients of sound policy. Successive conferences have agreed that it is necessary to have a definite and considered statement of the objects of policy, based on a survey of existing forest resources and the probable demands on the forests, to have reasonable stability in forest finance, and to have a trained technical staff properly constituted into a permanent forest service.

Passing from forest policy to the forests themselves, the conferences have stressed the point that successful forestry cannot be practised at large over ill-defined forests. It is necessary in order of procedure to demarcate the individual forests, to dedicate the land to forest use, to break up the forest masses into manageable working units and to apply to each unit such utilisation, silvicultural and protection measures as the circumstances may warrant. Considerable progress has been made in these directions, but there is still a vast amount of work to be done.

From the large number of other subjects which have engaged the attention of Empire Forestry Conferences, I would select for general comment one other group, namely, education, research and experiment. Individual parts of the Empire seem to have found it hard to make up their minds just what they want to do about education. There is general agreement that a high standard of technical training is required for the superior grades of forest services and that the material available locally for demonstrating forest technique is often defective. It was hoped after the Second Conference of 1923 that a satisfactory solution might be found in the foundation of an Imperial Forestry Institute in Great Britain to provide post-graduate and refresher courses which forestry students from all parts of the Empire could take in continuation of their local training. The Institute was duly set up and has received continued support from the British Forestry Commission and the Colonial Office. On the other hand, it has not received general support from the Dominions, partly for financial reasons and partly because overseas forestry education in some cases has not found its feet. The conception of an efficient Imperial Forestry Institute serving the needs of the whole Empire and dovetailing with local services received renewed stimulus at the recent South African Conference.

As regards research and experiment, there is much progress to be noted over the

course of the last fifteen years. Some half-dozen forest products laboratories are now at work on the numerous problems connected with the utilisation of timber. Nearly all the forest services are undertaking systematic investigations into the production of growing timber. Considerable advances have also been made in silvicultural technique, forest management and forest protection. Partly these improvements have come about as the result of the increased experience of the organised forest services, and partly as the result of *ad hoc* research and experimental work.

Forestry in the various Parts of the Empire

I propose now to deal very broadly with forestry in various parts of the Empire, noting as I go the salient points. I will begin with India, which had the first organised forest service and has contributed much to the spread of forestry ideas throughout the Empire.

India—The forests of India include the whole range of types, from tropical rain forest and mangrove through tropical deciduous forest to desert scrub, and through temperate broadleaved and coniferous to the timber line in the Himalayas at 12,000 feet. It is estimated that over five million people are employed on and about primary forest products, which include not only timber fuel and bamboos, but also fodder, cutch, lac, resin, etc. In spite of the large forest areas, imports exceed exports by about £320,000.

Burma is by far the most important Province. In 1928–9 it had about one-half the total area of forest and produced approximately one-third the gross forest revenue. For a number of years after the inception of a definite forest policy under Lord Dalhousie's Vice-Royalty (1855) forestry developed steadily. The higher technical staff formed a unified forest service (Imperial Forest Service) recruited and trained in Britain and on the Continent of Europe. The settlement of forest areas—the necessary prelude to systematic management—the preparation of working plans and the aggregation of practical experience in handling the forest, had all made good headway up to the time of the Great War. Further, the foundation of the Forest Research Institute at Dehra Dun in 1906 marked the first effort in the British Empire to apply research methods to forestry practice. After the war the modest institute at Dehra Dun was replaced by imposing buildings to house the forest products research work, the silviculturists and other specialists engaged on forest problems, and to provide space for educational activities. Recruitment on a large scale was begun to fill the vacancies in the Imperial Forest Service caused by the lack of appointments during the War years.

By these means great progress was being made in bringing the forests under systematic management and in improving forest technique, but the early post-war activities are gradually falling away. Recruitment from Britain was first reduced and then stopped, training for forest officers was started at Dehra Dun and later stopped. The forestry activities of the Government of India declined and the responsibility for the forests has leaned towards the Provinces. These changes

were but part of the great constitutional changes which were under consideration for India as a whole. In the upshot the Government of India Act provincialises the forests and the Imperial Forest Service as such will cease to exist. There can be little doubt, considered purely as a forestry question, the change will not be for the better. But considerations more important than the future of the forests were the determining factor. The next few years, therefore, are going to be a testing period for forestry in India. The individual provinces have to formulate their separate policies and, starting in some cases with inadequate and diminishing personnel, to build up staffs capable of carrying out the work.

Canada—The forests of Canada stretch in a great belt from the Maritime Provinces and the adjacent islands through Quebec and Ontario, in the north of the Prairie Provinces, over the Rockies to the coast and islands of British Columbia. The hardwood forests (with maples, oaks and hickories) lie chiefly to the south of a line from the southern end of Georgian Bay to the eastern Quebec townships. For the rest, the forests are coniferous except where forest fires have made way for poplar and birch.

The eastern forests have been heavily worked for a long time and very little, comparatively, remains now in a virgin condition. Apart from clearances for agriculture, the forests have been successively exploited for their splendid white pine timber, for their spruce timber, and now in the third stage for pulpwood to supply the great pulp and paper industry, and to a lesser degree for pine and spruce timber. Natural regeneration is usually profuse after felling, but at all stages forest fires have accompanied exploitation so that vast areas of young and immature growth have been destroyed. The central forests, lying north of the Great Plains, are of secondary commercial importance and, moreover, have been severely damaged by fire. More than half the total lumber produced now comes from the western forests, though as regards extent they are comparatively small. There the magnificent Douglas firs and red cedars are rapidly disappearing. Fires too play their destructive part in the regenerated areas.

It is impossible to over-estimate the importance of her forests to Canada from the point of view of either the present or the future well-being of the Dominion. During 1926–30 the capital invested in forest industries amounted on the average to $1,280 millions, the number of employees was 244,000, to whom $250 millions was paid in wages, while the value of the products was $583 millions. Exports at $172 millions ranked second only to agricultural products ($232 millions) in a total export trade of $634 millions.

On the long view it is obviously important to maintain the productivity of the forests, since much of the land is suitable for nothing else. There are also important considerations, such as the maintenance of forest cover for climatic and similar reasons. If forest exploitation had seriously to be curtailed agriculture would suffer severely, if only because in the winter season, when farm work is impossible, some 50,000 to 75,000 additional men are absorbed in forest operations.

Contrary to what has happened in the United States comparatively little of the

freehold of the forests has passed into private hands. Instead, the Crown has retained the soil and has leased to lumber and pulp companies the right to fell timber upon a system of payment for the quantities taken. The leases are nominally for a year, but in practice continue indefinitely. As an interim measure this system was satisfactory, because it retained the freehold in government hands, pending the introduction of more systematic management. On the other hand it places

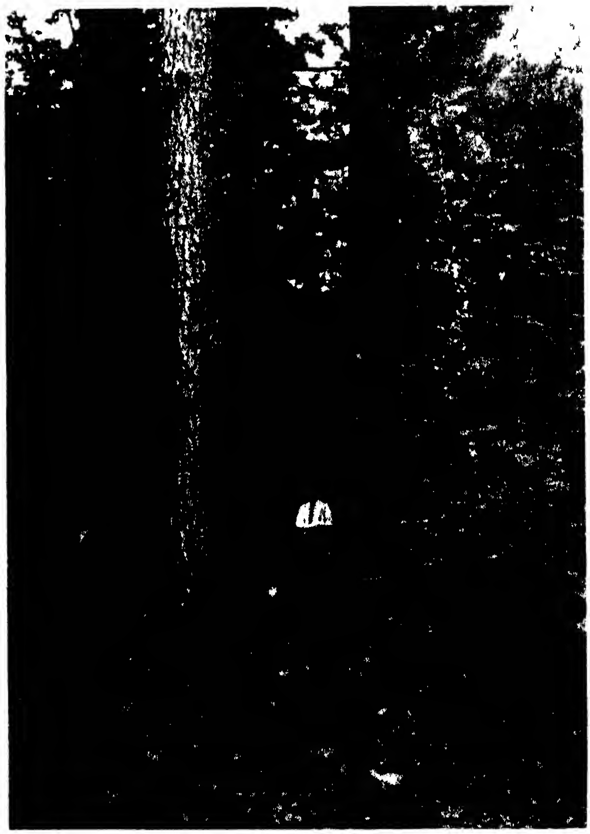
Douglas Fir in British Columbia (girth at breast height, 32 feet; estimated contents, merchantable bole only, 6,000 cubic feet)

the exploitation of the forests in the hands of people who are not actively interested in the re-growth of the forest.

Each of the Provinces, except Prince Edward Island, now has its forest service, while the Dominion Forest Service is concerned with forest research, economics and utilisation. The departmental figures indicate that apart from revenue collection and fire protection there can be little opportunity for the forest services to engage directly in the practice of forestry.

There are schools for training forest officers at the Universities of Toronto,

Fredericton, Vancouver and Laval, and also a Ranger School and Paper-making School in Quebec. Most of the research work is in the hands of the Dominion Forestry Branch. Forest Products Research has received most attention and there are well-equipped laboratories dealing with timber and with pulp and paper-



LARGE WHITE PINE (*Pinus strobus*) IN VIRGIN FOREST, LAKE TEMAGAMI, ONTARIO

making. In the forests there are seven experimental stations at which practical problems in silviculture and forest management are being investigated.

It is common knowledge that in Canada the consumption and destruction of timber and young growth by logging, fire, insects and fungi have been alarming. Attempts have been made, on inadequate data, to assess this forest wastage in terms of annual growth with a view to showing how long the current state of affairs could continue. I am inclined to regard the question as rather academic in character. The real question is whether the current practice of forestry is adequate. The indications are not re-assuring.

If we take as our standards the principles of forest policy laid down and confirmed by successive Empire Forestry Conferences we find important defects in the present system. The orderly steps which I have already detailed are proceeding all too slowly or not at all. Instead there seems to be a tendency to seek a short cut in broad schemes of fire protection.

The problem of the right management of the forests of Canada is both difficult and complex. It is complicated by the pressure of economic conditions, by great vested interests, by the multiplicity of forest services, and by other factors. Two things are clear: first, that a continuously prosperous Canada depends on a right solution being found and, secondly, that the solution will not be found by brushing aside basic principles.

The British Isles—The British Isles are dependent on imports for some 90 per cent. of their timber consumption. In an average year the total imports of Great Britain alone of timber and wood products are equivalent to about 1,000 million cubic feet of standing timber. Under such circumstances there is no question of these islands being self-supporting, but that a substantial reserve of standing timber is necessary for defence purposes was abundantly proved in the Great War.

The post-war forest policy is based largely on that consideration and also on the desire to put uncultivated land to better use. The Forestry Commissioners accordingly have as their objectives the maintenance of the productivity of the existing woods, which are mainly private, and the extension of the woodland area by extensive afforestation. The first objective is difficult or impossible of attainment in these days of high taxation. The Forestry Commissioners have made some progress with the second. At 30th September last, 890 square miles of plantable land had been acquired and 520 square miles planted.

Considerable attention has been paid to systematic research, and financial support has been given to various forms of forestry education.

A notable post-war development is the establishment of the Forest Products Research Laboratory at Princes Risborough under the Department of Scientific and Industrial Research. It is concerned broadly with the better utilisation of timber—both imported and home-grown. More recently also the Forestry Commissioners have been attempting to encourage the better marketing and utilisation of home-grown timber.

In the Irish Free State the Forestry Branch of the Department of Agriculture has been planting 3,000–4,000 acres annually. It is understood that a much bigger scheme is now under contemplation.

In Northern Ireland also some small-scale afforestations are in progress and even the Isle of Man has done some planting.

Australia—Forests cover only 3·3 per cent. of the land area. They are predominantly broadleaved and composed of eucalypts, of which there are several hundred species. There are also some relatively small areas of conifers. The really good forest is restricted to the areas of ample and regular rainfall, that is to say, mainly to the eastern, south-eastern and south-western coastal regions.

The original forest area has been considerably reduced by clearances for cultivation and by ring-barking and burning for grazing. With protection from fire, natural regeneration of the eucalypts is generally good and re-growth can often be secured from coppice shoots. The regeneration of the indigenous conifers is a more difficult matter.

The Federal Government has an Inspector-General of Forests who is in charge of the Forestry School and Commonwealth Forestry Bureau at Canberra. The Federal Government is also promoting research into forest products through its Research Department; in 1934 it made forestry grants totalling £322,000 to the different States for the relief of unemployment. The individual members of the Commonwealth are Sovereign States which own and control, through their respective forest services, their forest resources.

The State which has made the steadiest progress is *Western Australia*; indeed, the position deserves more than a passing word. Over a series of years an important export trade was built up in jarrah and karri timbers, with the almost inevitable result that the forests were overcut. The Government, in agreement with the timber trade, has taken steps to regulate the fellings so as to produce a sustained yield. In accordance with this sound procedure nearly all the best forest land has been dedicated to timber production and extensive regeneration, and thinning and fire protection operations are being systematically carried on.

South Australia has comparatively little indigenous forest. The activities of the Forest Department have been concentrated on the establishment of coniferous plantations (mainly *Pinus insignis*) in the south-east of the State. Some 75 square miles have already been planted and the work is proceeding at the rate of about 5,000 acres per annum.

In *Victoria* a good beginning has been made in dedicating forests and in thinning and protecting eucalyptus regrowth. It is not clear that the annual cut has been adjusted to the annual growth. Some 50 square miles of coniferous plantations have been made and the work is proceeding at the rate of 4,000–5,000 acres annually. There is a forest school at Creswick and a certain amount of experimental work is being done. An important problem which this State shares with New South Wales is the maintenance against soil erosion of forest cover in the Murray River basin.

The forestry position in *New South Wales* cannot be described as satisfactory. It is certain that in the best hardwood forests and also in the cypress pine forests of the interior cutting is proceeding too fast. The supplies of hoop pine have almost disappeared. Some attention has been paid to the regeneration and thinning of young eucalyptus stands and also to the formation of coniferous plantations, but the future of the latter work is now in doubt.

In *Queensland* at the present rate of cutting the important hoop pine and kauri will last for only fifteen to twenty years, though the position with regard to cypress pine is better. The hardwood situation as a whole is uncertain. The better-class eucalypt forests are being heavily overcut, but there are large quantities of "jungle" species which may find a use. In all some 170 square miles of forest

have been subjected to regeneration and improvement fellings. A certain amount of silvicultural and utilisation research is taking place.

No effective forestry has yet been done in *Tasmania*. The total area of forests is

Two Large Karri Trees (*Eucalyptus diversicolor*), Big Brook Forest, Western Australia

placed at 7,600 square miles, but only a small proportion has yet been inspected by the Forest Department.

Taken as a whole there seem to be three main problems before Australian foresters, *viz.*, to limit the cutting to the amount of the annual growth, to protect and tend the regrowth of eucalypts, and to plant a sufficiency of coniferous timber to make good the fast disappearing stock of indigenous softwood. It is necessary also to intensify forest products research with a view to making wider use of

inferior species. The supply of trained forest officers needs attention; at present the educational arrangements are far from satisfactory.

New Zealand—The splendid kauri forests have been largely depleted. The

LARGE KAURI TREE (*Agathis australis*) IN TRAUNSON KAURI PARK, AUCKLAND PROVINCE, NEW ZEALAND (girth at breast height, 34 feet 3 inches)

taxad forests are now commercially the most important and include a number of useful podocarps and other conifers. The nothofagus forests contain the main reserve of hardwoods.

Besides the indigenous forests there are the large areas of exotic plantations made in recent years by the Government and commercial companies. As in other parts of the Southern Hemisphere certain exotic conifers, such as *Pinus insignis*, make very rapid growth indeed. On the other hand, the indigenous conifers have either

failed to regenerate themselves on felled areas or make very slow growth. Consequently, when stock was taken of the position some fifteen to twenty years ago and it was found that depletion of the indigenous forests had reached a point which gave cause for alarm, it was determined to embark on a large state afforestation programme. About the same time a number of afforestation companies began active operations, so that in 1927 no less than 78,000 acres were afforested by all agencies and of that area nearly 50,000 acres were planted by companies.

At the Empire Forestry Conference in New Zealand in 1928 a policy of depending on exotic plantations and neglecting the indigenous forests was criticised. It appears from the latest report of the Forest Service that state planting of exotics on a large scale is to cease and that more attention is to be paid to the indigenous forests.

The Forestry Department in 1935 had under its control about 12,000 square miles, of which nearly one-half was permanent and the remainder provisional state forest. The work of extending and consolidating the boundaries of protection forests for such purposes as the prevention of erosion, regulation of stream flow, etc., is also being pushed forward. The Department is undertaking forest products research as well as some silvicultural research.

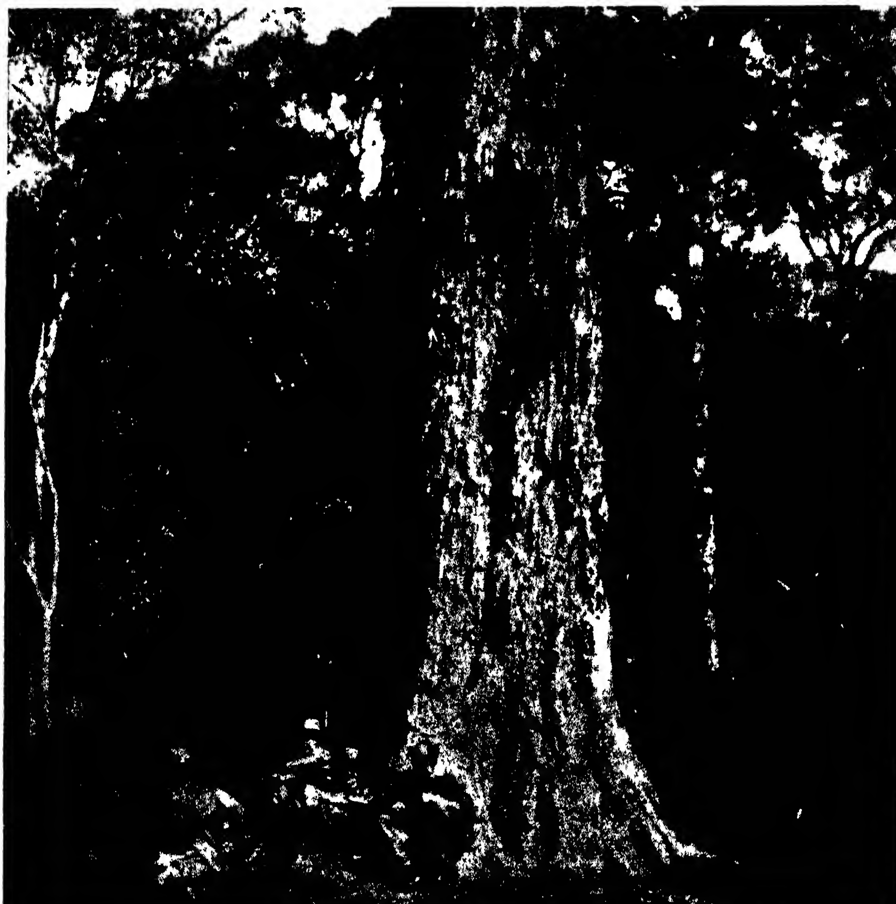
South Africa—The Union of South Africa cannot be described as a forest country, as less than 4 per cent. of its surface is classified as forest. The indigenous forests have for the most part been heavily depleted. They consist predominantly of broadleaved species with a small admixture of conifers. These conifers grow to large size as is fairly common with native conifers in the Southern Hemisphere, but have taken, in the virgin forest, some hundreds of years to do so. Regeneration has consequently been neglected until quite recently, and attention has been directed to forming plantations of exotic trees, chiefly eucalypts from Australia and pines from various parts of the Northern Hemisphere. In striking contrast with the indigenous trees many of these exotics grow at a prodigious rate. Under the optimum conditions *Eucalyptus saligna* will grow to 100 feet high in ten years, while the Mexican pine (*P. patula*) and the Californian pine (*P. insignis*), neither of which is held of much account in its native habitat, attain a height of 50 feet in the same time. Plantations of eucalypts are frequently worked on a rotation of eight years for mining timber. It is indeed fortunate for the mining industry of the Rand that exotics have proved so adaptable to South African conditions.

Mention should also be made of the *Acacia* or wattle plantations of Natal, which extend to nearly 800 square miles. The utilisation of the tan bark and the pitwood obtained from them is an important industry.

There is an active and well-staffed service dealing with forestry in the whole of the Union. Some 400 square miles of plantations have been made and the current rate of planting is about 15,000 acres yearly. It is the intention of Government to proceed on these lines and if necessary to augment the rate of planting for which some 550 square miles more are said to be suitable and available. The Forest Service also has charge of 700 square miles of indigenous high forest, to which

increasing attention is being paid, and of over 3,000 square miles of scrub forest and protective lands on which erosion is an important issue.

There is a well-equipped Forest Products Research Laboratory in Pretoria and



GIANT *Podocarpus latifolius*, NEAR DEEPWALLS FOREST, KNYSNA, SOUTH AFRICA (height 127 feet, length of clean bole, 70 feet, girth at breast height, 21 feet 4 inches, volume about 1,800 cubic feet)

a Silvicultural Research Branch working on the numerous problems connected with timber growing. Forest officers are trained at the University of Stellenbosch and the subordinate staff at the forest school at Saasveld near George.

Newfoundland and Labrador—There is very little authentic information about the forests, but recently the governing Commission appointed a forest officer to investigate the position. The coniferous species (white spruce, balsam fir and a

little white pine) support an important pulp and paper industry. It is believed that outside the pulp concessions the forests have been abused by fire and careless exploitation.

It is generally understood that there are important supplies of coniferous timber and pulpwood on the Labrador coast, but no reliable figures are available, nor has any extensive exploitation taken place.

Southern Rhodesia—There are 88,000 square miles of forest, of which one-fourth is stated to be merchantable. Apart from a small area of plantations it is all broad-leaved and except for a very small area of closed forest in the eastern border it is savannah. There is an export trade in Rhodesian " teak " to the Union of South Africa. Utilisation of the indigenous forest resources has been wasteful and recurrent fires do much harm Although Southern Rhodesia is in an early stage of development it is estimated that the net drain on the forests amounts to some 24 million cubic feet annually.

There is a small Forest Service which has charge of some 1,000 square miles of reserved forest and over 6,000 square miles of national parks, game reserves and unreserved forests.

It is sought to make good the wastage in indigenous forests by planting quick-growing conifers and eucalypts for which there are said to be many suitable sites. The Forest Service is planting 600–700 acres annually. Commercial companies are also active and have planted some 14,000 acres. It is stated that steps which should be urgently taken are the passing of a comprehensive Forest Act, more economic utilisation of the indigenous resources and better control of forest fires.

The Colonial Empire—The Colonial forests provide for the British and other markets important supplies of special timbers, such as true mahogany and greenheart from the West Indies, African mahoganies from West Africa, pencil cedar from Kenya, satinwood and ebony from Ceylon. The trade in second-class as well as first-class timbers can no doubt be increased by appropriate measures. Certainly the local use of the second-class timbers can be greatly extended and there is almost everywhere a marked tendency to pay more attention to this important question. Malaya, through its Forest Products Research Branch and administratively, has already made considerable progress. One of the objects in view there is an improvement of native houses in conformity with the general desire to raise the standard of living. The Colonial Office, which recruits forest officers for all the Colonial Services, has recently set up in London an organisation to promote the use and marketing of Colonial timbers.

Another important problem of very general interest is the relation of shifting cultivation to the forests. With settled British rule and the consequent increase in population the pressure on the forests becomes greater. This is the case in West Africa, in Ceylon, not so much in Malaya, but also in Sarawak, North Borneo and some other tropical Colonies.

The lives of large numbers of the natives are closely bound up with the forests. I have already referred to the importance to them of fuel and minor forest products,

many of which are of importance also in international trade. The items are numerous and surprising. The chewing gum industry, for example, makes use of chicle from British Honduras and jelutong from Malaya. Certain important cultivated crops, such as cocoa in the Gold Coast, are dependent on the maintenance of a degree of humidity obtainable only under forest conditions. It will be seen therefore, that the right treatment of the forests in a number of the Colonies is bound up with agriculture and with the improvement of native methods of cultivation.

I have left myself little time to deal with the individual Colonies.

In *West Africa* the incidence of shifting and other forms of cultivation is important. Sierra Leone has practically no merchantable forests left, the forests of the Gold Coast have been badly honeycombed, and in Nigeria about 1,000 square miles of forest are worked over annually. Some progress has been made in reserving land for forests (in Nigeria the area has been increased from 4,000 square miles in 1922 to 14,000 square miles in 1934), but tribal and communal systems of land tenure complicate the position. Some progress has also been made in regenerating the forests and in attempting to fix the encroaching sands of the Sahara.

The proportion of forest in the four *East African Colonies* is low, but the presence of the pencil cedar in the highlands is interesting. A good deal of useful plantation work has been done in Kenya. In Nyasaland a communal forest scheme, which devolves responsibility for forest management on local chiefs and headmen, will be watched with interest.

In the *West Indies*, British Honduras and British Guiana are essentially forest countries. Trinidad, of course, has wider interests. In British Honduras mahogany has been exploited without replacement for a couple of centuries and the pine forests have been neglected, or worse. Still it is interesting to note that a British firm is working its large forests on the basis of sustained yield and is also shipping direct to Britain sawn mahogany instead of the logs going, as formerly, to the United States. There are considerable supplies of greenheart and other timbers in British Guiana and the practice of forestry is dependent on their better utilisation. A beginning has been made in Trinidad in making better use of local timber, such as mora, and in regenerating the forests.

In the *Malayan* group there are on the peninsula eight forest services in the separate territories under British influence, but with reasonable working arrangements between them. The forests as a whole have been worked on a narrow front only, shifting cultivation is not a serious consideration, and dedication is well in hand. Interesting work has been done in exploitation and regeneration, there is an active research institute and a forestry school for training the subordinate staff. In Sarawak and British North Borneo there are small services dealing with large and difficult areas in which shifting cultivation is widespread.

The situation in *Ceylon* is interesting. In the face of shifting cultivation and other difficulties forestry has never really got going. At intervals there have been reports by experts on the forests, the latest quite recently, and sound advice has not

been wanting. It remains to be seen whether the Government, which constitutionally is in advance of most forms of colonial government, will act on it.

In the Mediterranean, *Cyprus* is attempting to set the pine and other forests in order, but is handicapped by a surplus of goats, which are very destructive of young growth. In *Palestine* interesting work is being done in afforestation and in protecting the indigenous growth for preventing erosion and for conserving water supplies.

The island of *Mauritius* has a small forest service which is engaged chiefly in making plantations of exotics. *Fiji* has done little in the way of forestry, and *Jamaica*, so far as I am aware, nothing at all.

There are, of course, other dependencies to which I might have referred if time permitted, but none of them is of outstanding forest importance.

SUMMARY

I have given a broad, and what you may consider a pessimistic, account of what is happening to the forests of the Empire, and it is a legitimate question to ask, now, whether real progress is being made. The answer is undoubtedly " yes." It is my good fortune to have attended all four Empire Forestry Conferences, and at the fourth, in South Africa last year, I could not help noting in the statements of delegates signs of definite improvement.

If the question, however, is whether the progress over all is adequate to the situation the answer is undoubtedly " no." Perhaps you will permit me to summarise the reasons. In the first place no country will practise forestry except under the spur of necessity. The history of forestry shows that plainly. In the second place forestry does not come easily to the British race. England has always had ready access to large supplies of cheap timber, while the daughter nations were faced originally not with the problem of conserving timber but with its destruction in order to reclaim land for agriculture. In certain Dominions important and powerful industries have been built up on the abundance of forest resources. Very rarely has one generation paused to consider whether it was taking out of the forests more than it was justly entitled to have. The rule rather has been to take what was wanted but to put nothing back. Again, our democratic forms of government are not always the best from the forestry point of view. There is a saying that " trees have no votes," and the ideal consequently would be to remove forest policy outside the realm of politics, as has fortunately been done in Great Britain. That course is not easy in newer countries, where the products of the soil are relatively more important, but it can be done if public opinion is made sufficiently aware of the dangers of unrestricted exploitation. These dangers are often very real. If forests are exploited or degraded beyond a certain point it is a very slow and expensive process getting them back to a state of productivity. In the meantime prosperous industries languish or decay. If destruction of forest cover is followed by erosion, the difficulties are greatly intensified.

The theory of an approaching timber famine may or may not be true, but the

importance to the human race of sound forest conservation is undeniable. Timber is a renewable crop which is satisfied with the minimum conditions of soil fertility, while wood itself is a raw material of infinite uses, both actual and potential. Indirectly, the beneficial influences of forests are great. To sweep them away is to lay the countryside open to manifold ills.

The slides which you have seen are no doubt beautiful in themselves, but I have shown them rather as illustrations of the magnificent primæval forests to which various parts of the Empire fell heirs. Soon these great trees will have disappeared except in remote places or where specially preserved as "museum specimens." The supplies of commercial timbers will then come from "second growth" forests.

DISCUSSION

THE CHAIRMAN: Sir Roy has been good enough to take us on a very interesting tour by magic carpet to all the forests of the Empire. After giving us in some directions a pessimistic idea of what is going on in the forestry world, I am glad he was able to wind up on a more hopeful note and show us that undoubtedly during the present generation there has been a very considerable advance in the methods of dealing with the forests of the Empire. The two points which strike me in hearing lectures of this nature are the enormous value of the forests which the Empire possesses, and at the same time the extraordinarily small number of foresters who have been trained to carry out the work. One knows, of course, the difficulties of all governments at the present day, but it seems to me really quite impossible for our real resources to be utilised by such a small number of men, who moreover have to be trained to carry out such diverse parts of their work as silviculture, exploitation, marketing, etc., and in addition are expected to have a real knowledge of the tribal laws and customs, which cause forest officers so much difficulty in many parts of the world.

THE RIGHT HON. SIR FRANCIS DYKE ACLAND, Bt., P.C., M.P. (Member of the Forestry Commission), said: The sort of thing that came into my mind as Sir Roy Robinson's lecture proceeded was the realisation that there has been a good deal of progress since the first Empire Conference, which I particularly remember. Things have clarified. In those days the work of clarification had a way of being put on to me. I remember vividly how Lord Lovat, after we had been discussing perhaps for a long morning some subject intimately connected with forestry and very necessary to be discussed, and when probably as many opinions had been expressed as there were persons to express them, would say at ten minutes to one: "Well, now, we have just ten minutes to consider the subject of research, and Mr. Acland will formulate what we have just agreed upon." And there was probably no agreement! I think that sort of thing is less likely to happen now. We do not all move in the direction we should like to move in, but we do all know pretty well in what direction we want to move, and what the different governments whom we serve ought to do, even if they do not do it.

One came across in the lecture the word "dedication" several times, which gives the forester to imagine some sort of security that he will have a continuing charge. I do not remember that word in the first Empire Conference, and on the whole I think there is very much greater security in the tenure of the forest officer's service than there used to be. There is clearly useful development taking place, and surely

APPENDIX I

FOREST AREA OF THE BRITISH EMPIRE (in square miles)

COUNTRY	*Conifers*			*Hardwoods*			*Total Forest Area*			TOTAL LAND AREA
	Merchantable	Unprofitable or inaccessible	Total	Merchantable	Unprofitable or inaccessible	Total	Merchantable	Unprofitable or inaccessible	Total	
Great Britain ..	1,630	780	2,410	1,780	740	2,520	3,410	1,520	4,930	87,830
Canada	584,230	375,000	59,230	216,550	78,300	294,850	800,780	453,300	1,254,080	3,466,560
Australia	4,900	800	5,700	38,500	37,800	76,300	43,400	38,600	82,000	2,450,710
New Zealand ..	3,900	6,700	10,600	1,900	8,200	10,100	5,800	14,900	20,700	105,000
Union of South Africa	330	10	340	2,320	13,870	16,190	2,650	13,880	16,530	472,550
Irish Free State ..	120	10	130	280	—	280	400	10	410	26,600
Newfoundland ..	10,000	23,000	33,000	2,000	5,000	7,000	12,000	28,000	40,000	162,750
India	2,060	2,800	4,860	176,750	167,500	344,250	178,810	170,300	349,110	1,126,920
Southern Rhodesia	—	10	10	22,200	66,600	88,800	22,200	66,610	88,810	150,350
Colonial Empire ..	1,860	1,390	3,250	116,070	489,640	605,710	117,930	491,030	608,960	1,688,390
TOTAL.. ..	609,030	410,500	1,019,530	578,350	867,650	1,446,000	1,187,380	1,278,150	2,465,530	9,737,660

APPENDIX II

FOREST AREA OF THE COLONIAL EMPIRE (in square miles)

COUNTRY	Conifers			Hardwoods			Total Forest Area			TOTAL LAND AREA
	Mer-chant-able	Unpro-fitable or inac-cessible	Total	Mer-chant-able	Unpro-fitable or inac-cessible	Total	Mer-chant-able	Unpro-fitable or inac-cessible	Total	
Kenya	850	170	1,020	810	3,990	4,800	1,660	4,160	5,820	219,730
Uganda	110	170	280	730	910	1,640	840	1,080	1,920	80,590
Tanganyika ..	—	—	—	1,930	2,210	4,140	1,930	2,210	4,140	365,000
Nyasaland	—	—	—	340	4,100	4,440	340	4,100	4,440	37,600
Northern Rhodesia	—	—	—	22,000	154,000	176,000	22,000	154,000	176,000	288,000
Nigeria	—	—	—	53,000	180,000	233,000	53,000	180,000	233,000	368,000
Gold Coast.. ..	—	—	—	9,000	4,900	13,900	9,000	4,900	13,900	91,840
Sierra Leone ..	—	—	—	10	790	800	10	790	800	27,250
Mauritius	—	—	—	70	100	170	70	100	170	720
British Guiana ..	—	—	—	14,000	63,000	77,000	14,000	63,000	77,000	89,480
British Honduras ..	570	800	1,370	5,160	1,480	6,640	5,730	2,280	8,010	8,870
Trinidad & Tobago	—	—	—	710	200	910	710	200	910	1,980
Ceylon	—	—	—	3,700	13,000	16,700	3,700	13,000	16,700	25,500
Cyprus	330	250	580	20	100	120	350	350	700	3,580
North Borneo ..	—	—	—	3,970	20,180	24,150	3,970	20,180	24,150	29,350
Malaya	—	—	—	620	40,680	41,300	620	40,680	41,300	50,900
TOTAL.. ..	1,860	1,390	3,250	116,070	489,640	605,710	117,930	491,030	608,960	1,688,390

from that point of view it is a good thing that these Empire Conferences should take place, because they focus and centralise information and make it possible at evenings such as this to learn of the position that has been attained.

PROFESSOR R. S. TROUP, C.M.G., C.I.E., D.Sc., F.R.S., said : I am one of the small band of people who have been privileged, like Sir Roy Robinson, to attend all the Empire Forestry Conferences held so far. We have seen during the course of those conferences, in the guise of visitors, a considerable part of the Empire and of the forestry of the Empire. Since leaving India some fifteen or sixteen years ago it has been my privilege to be associated a good deal with forestry in the Colonies, that is to say, in the territories under the Colonial Office, and what has struck me there very forcibly is the steady progress that is being made, at any rate in those Colonies which have taken up forestry seriously. They suffer from certain disadvantages as compared with the Dominions and India. They are so small and so isolated that they are, so to speak, working in watertight compartments. A great step forward has been taken recently in the constitution of a combined colonial forest service, and that should go a good way towards linking up the procedure and the working in the different Colonies.

Another point of difficulty is the fact that in the more unhealthy Colonies continuity is so severely broken by the short tours which the officers have to put in. No sooner have they got down to their work than it is time for them to go home on leave and recuperate. That problem is a difficult one to solve, and it has not been satisfactorily solved yet. The one thing that must be emphasised in regard to Empire forestry is the great necessity for continuity. Forestry is a long-range subject, and it is impossible to carry on to the best advantage unless one can look ahead and work in a continuous manner, year after year and decade after decade.

Above all, we should like to see forestry completely dissociated from politics. In some of the Dominions and elsewhere politics have been an obstacle to progress. Speaking as a forester—and I am sure others will agree with me—we should like to be allowed to get on with our jobs untrammelled by political considerations and vested interests.

SIR GEORGE J. F. TOMLINSON, K.C.M.G., C.B.E. (Assistant Under-Secretary of State, Colonial Office), said : I have nothing to do with forestry policy at the Colonial Office. I have something to do with forestry training and recruitment, and if there is one lesson that I have learnt in the five years that I have spent in the Colonial Office it is the overwhelming importance of the need of continuity in forestry policy in so far as that is reflected in the demand for men. The Chairman has pointed out the extraordinarily small number of men that are employed in relation to the total area of the forests of the Empire, but nevertheless there is this distinguishing feature about forestry work, that outside Government service there are practically no openings of any kind. We recruit agriculturists. We train them for the particular work we want them to do, but if a slump comes and we are not able to place them, we have at least by training them helped them to find work elsewhere ; but not so with the foresters. If forestry departments in India or the Dominions or the Colonies, or the Forestry Commission, cannot find room for them, there are very few openings for them outside Government service. The result of this is that owing to the decrease in the demand for foresters during the slump, through the general cutting down of budgets, the number of men who to-day are taking up forestry at the universities is so much diminished that there is a risk that as the demand for forest officers expands in the next few years we may not be able to meet it; and therefore I would impress upon all

who are concerned, and can exercise authority, in these matters, the importance of ensuring a greater steadiness of demand for forest officers, in order that recruitment and training may be stabilised over a period of years.

May I just say one more word in regard to the training of forest officers ? We at the Colonial Office are closely interested in the Imperial Forestry Institute at Oxford, over which Professor Troup presided with so much distinction for so many years. The progress of the Institute has been, I think I may claim, continuous from the start, considering the handicaps under which it has suffered from want of funds. It owed its inauguration to the first Empire Forestry Conference, and successive conferences have endorsed its services to forestry throughout the Empire. A difficulty which has now been resolved has been to find the Institute's proper place within the framework of Oxford University. That has been achieved by means of a statute passed at the beginning of last year, which defines the relation of the Institute to the University and to the Department of Forestry. Since January last a further change has taken place in that Professor Troup, who presided over the Institute and guided its fortunes with so much success from the start and who as head of the Forestry Department still retains a paternal and guiding interest in the Institute, has now handed over immediate control to Mr. Oliphant, of Malaya, who, having attended the Empire Forestry Conference in South Africa, took up his duties as Director of the Institute at the beginning of this year. But if there is one lesson we have learnt in the last few years it is that if the imperial character of the Institute is to be maintained and developed, its financial resources must be increased. The reason why we have not been able to meet all the demands upon it, particularly in regard to the service of information, is simply the lack of funds, and it is our hope that one result of the recent Empire Forestry Conference in South Africa will be that the Dominions may be induced, by increasing their contributions to the Institute, to put it in a position to render enhanced services to the Forestry Departments of the Empire.

Mr. Hal Williams, M.I.Mech.E., M.I.E.E., asked : Is a gum tree a deep-rooted tree or a flat-rooted tree ? I am asking because quite recently a very strong wind of almost cyclonic violence passed through the North Island of New Zealand and the imported gum trees fell down like ninepins, and brought up a large pan of earth with them. My early impression of gum trees was that they were deep-rooted, but perhaps I am wrong.

Sir Hugh Watson (Timber Adviser to the High Commissioner for India), said : All my service has been in Burma, and the principal tree there is the teak tree. The Burma output of teak is about one-fifth of the trade output of timber in the Indian Empire. Teak is regarded in Burma as a royal tree, and so long as the revised Government can maintain that respect for the tree I should say that the future of the Burma forests was more or less assured.

Professor E. P. Stebbing, M.A., said : I listened to Sir Roy's lecture with very great interest, but I think that in some respects he was a little pessimistic about the present position and the future, except in one point which he did not specially mention. That is the recruiting of the various departments, especially the colonial departments. As was rightly said to-night, progress has been made in forestry since the War, and I should think probably the colonial part of the Empire has progressed very considerably ; but I think this progress has to a considerable extent ceased with the crisis of 1931, because since then the staffs have been very considerably reduced,

certainly in many of the Colonies, and the work that had been started must have fallen very far back. In West Africa two years ago I saw some remarkable examples of work that had been started—silvicultural work—but shortage of staff in a tropical country obviously means that your results must disappear if they cannot be supervised, as, for example, in British Honduras, or valuable work be curtailed, as in Nigeria.

Two things have happened since the commencement in 1931 of the cutting down of staffs and the cessation of recruitment. At the universities, the men taking forestry risk their future on getting a Government forestry appointment, for a degree of B.Sc. is rather a specialised and technical degree and therefore not necessarily of value for other walks in life. The second serious event is the " axing " which has taken place since the 1931 crisis owing to the deficient budgets in the various colonial services. That is also going to have a bad effect during the next few years. In the universities numbers have fallen, and now we shall not be able to supply appointments which may be available during the next three or four years in the forest colonial services. You cannot train a man in under three years, and from twenty men a year we are dropping down to five or six. Therefore, if fifteen to twenty appointments were offered two or three years hence there would probably not be men to take them.

Another unfortunate thing that is creeping in in connexion with forestry is the spirit of unrest (that is not quite the word, but it is near enough to express my meaning) amongst the men themselves when they find that after three or four years' service they are " axed " and have no further chance. It is a question, I admit, whether this form of retrenchment could be avoided. I make no reflections of any kind, but I am just putting the position as it is. That Major Furze and his branch have done all they could and more to relieve and bolster up the position in this respect I am fully aware, but this feeling has come about ; and we have to face the fact that the better type of youngster are now hesitating to take forestry at the universities because there are few appointments ; or if they get an appointment there is no assurance that they will keep it. In India, when we went into the forestry service in the old days, we signed a contract with the Secretary of State and could not be " axed." There appears to be a different sort of idea abroad to-day, and it is very much harder for those responsible for education and for supplying a demand for forestry service, if there is no certainty that the government appointment is an appointment for a man's active life's service.

Mr. J. R. Ainslie, B.Sc., F.L.S. (Chief Conservator of Forests, Nigeria), said : When one has spent twenty-five to thirty years in tropical jungles one has had little opportunity of addressing such a distinguished gathering as this, and representing as I do a comparatively little known part of the Empire it is with some diffidence that I speak at all.

I listened with tremendous interest to Sir Roy Robinson's discourse upon the gigantic subject under discussion. In regard to Nigeria, Sir Roy laid particular stress on the value of the forests in the protection of the agricultural crops of the country. I was glad of this ; for as regards forestry and agriculture Nigeria is a country of considerable importance, and is likely to be of more importance in the future. The main agricultural products are vegetable fats and oils, which are made into margarine, soap, cosmetics, etc., and sold in the European and American markets ; indeed, it has been said that we cannot shave or wash, and a lady cannot bake a cake without paying tribute to the revenues of British West Africa ; so that civilisation has a lot to thank the " white man's grave " for ; but it must always be remembered these products would cease to exist were the forests not there to protect them.

There is one point with regard to the West African forests that Sir Roy did not

mention, and I think it deserves consideration: that is, that Nigeria has a tremendous stock of hardwoods, probably one of the biggest blocks of hardwood forests in the world. The actual area of the forests is a quarter of a million square miles, or almost one-seventh of the total area of the forests of the British Empire; and this immense forest area is the nearest block of hardwoods of any size to England, and entirely under English control. Again, it is the only source of supply of hardwoods of any large size under English control and reasonably and equally accessible from Canada, South Africa and England; this I consider is a point of considerable strategic importance in times of war or in times internationally so unsettled as these.

Professor Stebbing drew attention to the decay of silvicultural research in certain parts of French West Africa. May I say that in Nigeria, in spite of the fact that we have had to undergo retrenchment and have had materially to reduce our staff, research in silviculture has steadily progressed since we initiated it in 1928. Professor Stebbing when in West Africa spent most of his time in the French colonies, and in the very short visit he paid to Nigeria he had not the time to see what silvicultural work was going on.

About the depth of eucalyptus roots; I am of the opinion that it depends partly on the species and possibly to a smaller extent on the soil. In Ceylon, many tea planters have established great belts of eucalypts along ridges to act as wind breaks, and this they would not have done if the particular species had been liable to be blown down. The species mainly used is *Eucalyptus robusta* and to my knowledge this withstands terrific wind storms; on the other hand, as Mr. Legat points out, the blue gum (*E. globulus*) is liable to windfall.

Sir Alexander Rodger, O.B.E. (Member of the Forestry Commission), said: There is a point I have always been very keen on, and that is Publicity. I think the British Empire lacks a forest sense. You will find that in India; and in this country one constantly comes across people who have never heard of the Forestry Commission. That is rather incredible, but I believe it is perfectly true. The forest officer is as a rule a very modest and retiring person. He does the greater part of his work in tracts remote from man, and hides his light under a bushel. We ought to give that up. I think that people should really become interested in forestry and realise what immense benefit it can be to any country, and it is up to us professional foresters to do all we can to impress the other members of our community with its tremendous advantages.

Mr. Walter Smith (Member of the Forestry Commission), said: I do not desire to introduce what might be considered a discordant note. My point is rather to remove one, because Sir Roy introduced one towards the end of his lecture, and it has been supplemented by Professor Troup when he said that we want to keep politics out of forestry. Nearly all who have spoken here to-night, connected though they have been with different parts of the Empire, have been Government officials, which seems to suggest that forestry only prospers or gets on to proper lines when the state takes a hand in the business. In many instances, if I understand the position correctly, it is only when the state has realised how much cold commercialism has done to destroy the forests of the export countries that we get forestry on to a healthy basis, and when one realises that in so many parts of the Empire the funds to make this really organised system of forestry possible come out of the exchequers of the country, it is indeed strange to hear people arguing that we ought to keep politics out of it.

THE LECTURER replied: There are no outstanding questions for me to answer. I would agree with the point made by Sir George Tomlinson and Professor Stebbing that foresight and stability in the recruitment of forest officers are very important. Professor Troup and Mr. Walter Smith have referred to the place of politics in forestry. It is certain that political interference in current forest management is unhealthy and has, in fact, produced undesirable results in some parts of the Empire. On the other hand, if we identify politics with statesmanship and statesmanship with sound legislation there is no doubt that the forester must await political action before he can even begin to practise good forestry.

THE CHAIRMAN proposed a hearty vote of thanks to the lecturer for his paper, and, this being carried unanimously, the meeting closed.

NOTES ON BOOKS

NORDISK FOTOGRAFI, 1935. Edited by Helmer Backstrom. London: B. T. Batsford, Ltd.

This fine book of Scandinavian photographs is unmistakably the reflection of a calm national temperament. Violent movement is expressed in one picture only—it is of a hurdler with face distorted and muscles taut. He is an American. The two northern hikers on the opposite page (44) are typically bland. The bridal couple on the first picture are dignity itself. A pale sunlight falls on the blossoms, the snow or the pavements, casting long shadows. In an atmosphere of old-world peace grandfather reads history to a good little girl with plaits. There are some typical modern effects, but with no exaggerated striving after them.

Some of the nature pictures are strikingly beautiful. Mr. Tschernochvostoff, representing Finland, has a wonderful group of silver larches on page 66: they are almost bare of leaves, and one sees winter rolling up darkly from the north towards them. The grandfather and little girl mentioned above is both *genre* and perfect portraiture: Mr. Lindegaard (a Dane) takes rank with Mrs. Julia Cameron.

P. B.

OBITUARY

SIR ARCHIBALD DENNY, Bt.—Sir Archibald Denny, who died suddenly on May 29th at the age of 76, was a director in the famous shipbuilding firm of Wm. Denny & Brothers, Ltd., Dumbarton. It was through the initiative of this firm that the turbine engine first assumed its important place in commercial shipbuilding, and Sir Archibald himself was the creator of the well-known type of cross-Channel steamer, serving every first-class trade route, in which his firm have specialized. Among the many public positions which he occupied in connection with his profession were those of President of the Institution of Junior Engineers, of the Engineers and Shipbuilders of Scotland and of the Institute of Marine Engineers, and Vice-President of the Institution of Naval Architects. His public services were recognized by the conferment of a baronetcy in 1913.

Sir Archibald had been a Fellow of the Society since 1890 and was a member of the Council for the three years 1924–26. He had been a member of the Thomas Gray Memorial Trust Committee since it was formed in 1924 and took a leading part in its early deliberations as to the lines on which the Trust moneys should be administered.

SIR FREDERICK JOHN JONES, Bt.—The death is announced at the age of 82 of Sir Frederick Jones, who was twice President of the Mining Association of Great Britain and sometime President of the Coal Conciliation Board of England and Wales. Sir Frederick was for many years a leading figure in the commercial and industrial life of South Yorkshire, and as head of the Rother Vale group of collieries, now part of the organization of the United Steel Companies, presided over the meetings of the South Yorkshire Coalowners' Association. He was also chairman of several iron and steel companies, and of the Workington Harbour and Dock Board. He was created a baronet in 1919. Sir Frederick Jones had been a Fellow of the Society since 1901.

GENERAL NOTES

SUMMER COURSE AT THE COURTAULD INSTITUTE OF ART.—A summer course in the history of art has been arranged by the Courtauld Institute of Art from August 5th to September 4th. The course is under the direction of Mr. Geoffrey Webb, and the subject will be the art of the Renaissance, with special reference to collections and works of art in England. In addition to the lectures at the Courtauld Institute, organised visits will be paid to a number of museums, galleries and private collections and to historic buildings in or near London. The fee for the whole course is five guineas, for single lectures 3*s*., excluding the cost of tours and excursions. Further information and forms of application may be obtained from the Secretary to the Summer Course, Courtauld Institute of Art, London, W.1, but it should be noted that no application will be accepted after July 1st.

EMPIRE SUMMER SCHOOL.—The fourth Empire Summer School will be held at the University of Bristol from July 24th to July 31st, under the auspices of the Royal Empire Society. It is open to all men and women interested in the British Empire. Addresses on important questions of current interest will be given by a large panel of eminent lecturers and there will be opportunities for discussion at each meeting. A number of interesting events have been arranged in connection with the course, including visits to local industries and to places of interest in the neighbourhood of Bristol. The entrance fee is one guinea, and the charge for accommodation for the week is £4 10*s*. Further particulars may be obtained on application to the Secretary, Royal Empire Society, 17 Carlton House Terrace, S.W.1.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, JUNE 15..Psychological Society, British, at 55 Russell Square, W.C. 6 p.m. J. Meloun, "**Handwriting as a Means of Psychodiagnosis.**"

TUESDAY, JUNE 16..Civil Engineers, Institution of, Great George Street, S.W. 6 p.m. A. W. K. Billings, "**Water Power in Brazil, with special reference to the Sao Paulo Development.**"

East Indian Association, at Caxton Hall, Westminster, S.W. 4.30 p.m. Dr. R. Young, "**The Social Progress of Indian Women.**"

Eugenics Society, at the Linnean Society, Burlington House, W. 5.15 p.m. Dr. R. B. Cattell, "**Is National Intelligence Declining?**"

Statistical Society, Royal, Royal Society of Arts, John Street, W.C. 5.15 p.m. Prof. Major Greenwood, "**English Death Rates: Past, Present and Future.**"

WEDNESDAY, JUNE 17..Folk-Lore Society, at University College, Gower Street, W.C. 8 p.m. L. F. Newman, J. Saltmarsh and R. V. Sayce, "**The Folklore of the Eastern Counties.**"

THURSDAY, JUNE 18..Imperial Institute, South Kensington, S.W. 2.30 p.m. L. W. Phillips, "**Western Australia.**"

University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. L. Ashton, "**Islamic Pottery.**" (Lecture I.)

FRIDAY, JUNE 19..Psychological Society, British, 55 Russell Square, W.C. 8.30 p.m. Dr. J. R. Rees, "**Mental Health and Mental Sickness.**"

University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. L. Ashton, "**Islamic Pottery.**" (Lecture II.)

JOURNAL OF THE ROYAL SOCIETY OF ARTS

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

FINANCIAL STATEMENT FOR 1935

The following statement is published in this week's *Journal* in accordance with Sec. 25 of the Society's Bye-laws :—

INCOME AND EXPENDITURE ACCOUNT

January 1st to December 31st, 1935

Dr.

				£	s.	d.	£	s.	d.
To *Journal*, including Printing, Publishing and Advertisements				2,698	14	2			
,, Library and Bookbinding				83	6	9			
,, Medals—									
Albert	22	10	6						
Society's	23	10	6						
				46	1	0			
,, Cantor Lectures				72	14	6			
							2,900	16	5
,, Expenses of Examinations							12,590	11	4
,, House—									
Rates and Taxes				373	1	6			
Insurance, Gas, Coal, Expenses and Charges incidental to Meetings				1,090	10	0			
Repairs				111	19	3			
							1,575	10	9
,, Office Expenses—									
Salaries, Wages and Pensions				4,199	7	6			
Stationery and Office Printing				476	19	11			
Postages, Parcels, Messengers' Fares				315	0	2			
							4,991	7	7
,, Advertising							312	3	10
,, Committees— General Expenses							50	0	0
,, Interest on Bank Overdraft							149	18	3
,, Superannuation Fund							785	18	0
,, Story of the Society							425	10	0
,, Art in Industry Exhibition							12	14	10
,, Prizes to Art Teachers							33	16	11
,, Balance being Excess of Income over Expenditure transferred to Capital Account (*see* Balance Sheet)							1,851	0	7
							£25,679	8	6

Cr.

	£	s.	d	£	s.	d
By Subscriptions	8,149	13	6			
,, Life Compositions	1,112	12	0			
				9,262	5	6
,, Interest and Dividends on Society's Investments	193	19	9			
,, Ground Rents	369	12	0			
,, Interest, Dividends and Ground Rents from Trust Funds for General Purposes	444	18	3			
,, Do. from Building and Endowment Funds	15	15	7			
				1,024	5	7
,, Sales, etc. :—						
Journal	269	16	9			
Do. Advertisements	800	0	0			
Cantor Lectures	98	19	5			
				1,168	16	2
,, Examination Fees and Advertisements in and Sale of Examination Papers				12,944	17	3
,, Charges for expenses for the use of Meeting Room				426	8	3
,, Rent of Cellars				75	1	0
,, Donation				10	10	0
,, Legacies				767	4	9
				£25,679	8	6

TRUST INCOME AND EXPENDITURE ACCOUNTS.

Dr.

	£	s.	d.	£	s.	d.
THOMAS HOWARD TRUST—						
To Balance due to the Society, January 1st, 1935	163	7	1			
Interest on Investment.........	19	19	0			
,, Balance due to Society.........				143	8	1
BENJAMIN SHAW TRUST—						
Balance, January 1st, 1935...	16	10	6			
Interest on Investments	3	5	8			
	19	16	2			
Less paid for Lectures and Printing	52	7	6			
,, Balance due to Society.........				32	11	4
FOTHERGILL TRUST—						
,, Balance due to Society.........	29	7	7			
Interest on Investment.........	9	11	0			
,, Balance due to Society.........				19	16	7
THOMAS GRAY TRUST—						
,, Balance due to the Society, January 1st, 1935	22	6	2			
Interest on Investment.........	316	13	6			
	294	7	4			
Less paid for Prizes Printing, Postage, etc....	337	0	9			
,, Balance due to Society..........................				42	13	5
,, Balance forward				213	5	1
Carried forward				451	14	6

Cr.

	£	s.	d.	Trust Accumulations, Dec. 31st, 1935. £	s.	d.
DAVIS TRUST—						
By Interest on Investments.........	78	2	8			
Less Transfer to Society's Income and Expenditure Account	78	2	8	–	–	–
DR. SWINEY TRUST—						
,, Balance, January 1st, 1935 ...	40	0	0			
,, Ground Rents (Income from)	180	0	0			
	220	0	0			
Transfer to Society's Income and Expenditure Account...	140	0	0	80	0	0
CANTOR TRUST—						
,, Interest on Investments.........	226	15	7			
Transfer to Society's Income and Expenditure Account...	226	15	7	–	–	–
MULREADY TRUST—						
,, Balance, January 1st, 1935...	17	8	4			
,, Interest on Investments.........	3	17	10	21	6	2
OWEN JONES MEMORIAL TRUST—						
,, Balance January 1st, 1935 ...	15	13	4			
,, Interest on Investments.........	15	13	4	31	6	8
FRANCIS COBB TRUST—						
,, Balance, January 1st, 1935...	42	11	3			
,, Interest on Investments.........	8	18	10	51	10	1
LE NEVE FOSTER TRUST—						
,, Balance, January 1st, 1935 ...	72	11	1			
,, Interest on Investments.........	6	7	10	78	18	11
JOHN STOCK TRUST—						
,, Balance, January 1st, 1935...	13	0	5			
,, Interest on Investments.........	2	9	2	15	9	7
NORTH LONDON EXHIBITION TRUST—						
,, Balance January 1st, 1935 ...	3	16	1			
,, Interest on Investments.........	4	14	6	8	10	7
DR. ALDRED TRUST—						
,, Balance, January 1st, 1935...	10	13	7			
,, Interest on Investments.........	5	8	2	16	1	9
TRUEMAN WOOD LECTURE TRUST—						
,, Interest on Investments	32	10	10			
Less due for Lecture and Printing	32	10	10	–	–	–
Carried forward				303	3	9

TRUST INCOME AND EXPENDITURE ACCOUNTS—*continued.*

Dr.

	£	s.	d.
Brought forward	451	14	6
	£451	14	6

Cr.

	£	s.	d.	£	s.	d.
Brought forward				303	3	9
SIR GEORGE BIRDWOOD MEMORIAL TRUST—						
By Balance January 1st, 1935 ...	25	14	8			
„ Interest on Investments	25	14	8			
	51	9	4			
Less paid for Lectures and and Printing	51	9	4			
RUSSIAN EMBASSY PRIZE—						
„ Balance, January 1st, 1934...	28	0	0			
„ Interest on Investments	3	10	0			
				31	10	0
DR. MANN TRUST—						
„ Interest on Investments	36	0	0			
Less paid for Lectures	36	0	0			
				—	—	—
ART CONGRESS STUDENTSHIP—						
„ Balance, January 1st, 1934...	58	17	0			
„ Interest on Investments	58	3	9			
				117	0	9
				£451	14	6

BALANCE SHEET, December 31st, 1935

	£	s.	d.	£	s.	d.
Capital Account—						
As on January 1st, 1935	71,609	0	0			
Donation *re* Building Fund	7	1	6			
Profit on Sale of Investment	1,317	3	11			
Plus Income and Expenditure Account Balance	1,851	0	7			
				74,784	6	0
Sundry Creditors				1,177	18	10
Bank Overdraft				2,434	18	11
Industrial Art Fund (Donations received and not yet expended)				278	5	5
Trust Funds—						
Capital Account	25,410	6	0			
Accumulations 213 5 1						
Account due... 15 15 0						
	229	0	1			
				25,639	6	1
				£104,314	15	3

	£	s.	d.	£	s.	d.
Freehold Premises as on December 31st, 1934				50,787	16	7
Books, Pictures, etc.				10,000	0	0
Investments (see Schedule)...				11,756	5	0
Subscriptions outstanding ...				2,520	0	0
Sundry Debtors, etc.				1,344	7	8
Paid on account of 1936 Examinations				2,400	0	0
Trust Funds—						
Investments	25,410	6	0			
Ground Rents	90	0	0			
				25,500	6	0
Cash in hand				6	0	0
				£104,314	15	3

We have audited the above Accounts and Balance Sheet for 1935 *with the books, accounts and vouchers relating thereto, and certify them as being in accordance therewith. We have verified the Bank Balances and investments.*

KNOX, CROPPER & CO.,
Chartered Accountants

Spencer House, South Place, E.C.2.
May 1*st*, 1936.

PRESERVATION OF ANCIENT COTTAGES FUND

INCOME AND EXPENDITURE ACCOUNT

for the year ended December 31st, 1935.

	£ s. d.		£ s. d.
To Land Tax and Insurance	4 5 10	By Donations	10 16 6
,, Balance, being excess of Income over Expenditure, transferred to Capital Account	43 0 11	,, Interest on Investments	21 15 0
		,, Rents	14 15 3
	£47 6 9		£47 6 9

BALANCE SHEET, December 31st, 1935.

	£ s. d.	£ s. d.		£ s. d.
Capital Account—			Cottages at Drayton St. Leonards (James Cranstoun Bequest)—estimated value	1,000 0 0
As on December 31st, 1934	1,733 0 9		£556 8s. 8d. Agricultural Mortgage Corporation 4½% Debenture Stock at cost (James Cranstoun Legacy)	540 8 10
Add Income and Expenditure Account Balance	43 0 11	1,776 1 8	£55 Hampstead Garden Suburb Debenture Stock value at par	55 0 0
			Loan to British Legion, Minster	50 0 0
			Sundry Debtors	14 11 6
			Balance at Bank	116 1 4
		£1,776 1 8		£1,776 1 8

We have audited the above Account and Balance Sheet for 1935 with the books, accounts and vouchers relating thereto, and certify them as being in accordance therewith. We have verified the Bank Balance and investments.

KNOX, CROPPER & CO.,
Chartered Accountants.

Spencer House, South Place, E.C.2.
May 1st, 1936.

TRUST FUNDS INVESTMENTS SCHEDULE

		Stock held.	Value at date of Bequest or Transfer.	Approx. Market Value on Dec. 31, 1935
Alfred Davies Bequest	£1,953 0 0	Great Indian Peninsula Railway 4 per cent. Guaranteed Debenture Stock	£1,800 0 0	£2,070 0 0
Dr. Swiney's Bequest	4,477 10 0	Ground rents (amount expended)	4,477 10 0	4,477 10 0
Dr. Cantor's Bequest	2,562 7 2	3½ per cent. War Loan	2,695 11 3	2,716 0 0
Mulready Trust	111 0 9	3½ per cent. War Loan	109 10 1	118 0 0
Howard Trust	399 0 0	London Transport 5 per cent. "B" Stock	510 9 5	513 0 0
Owen Jones Trust	522 3 2	India 3 per cent. Stock	423 0 0	449 0 0
Dr. Cantor's Bequest	3,273 16 6	Do. do.	2,573 10 0	2,815 0 0
	648 19 7	Bombay and Baroda Railway Guaranteed 3 per cent. Stock		717 0 0
J. Murray and others, Building Fund	20 16 4	India 3½ per cent. Stock	20 10 0	20 0 0
	38 11 0	3½ per cent. War Loan	54 18 0	41 0 0
Francis Cobb Trust	255 14 1	New South Wales 3½ per cent. Stock, 1930 50	250 0 0	256 0 0
Le Neve Foster Trust	140 3 1	3½ per cent. Conversion Loan	100 0 0	151 0 0
	42 2 1	3½ do. War Loan	40 0 0	45 0 0
John Stock Trust	70 4 0	3½ do. do.	100 0 0	74 0 0
Shaw Trust	93 12 0	3½ do. do.	129 6 8	99 0 0
North London Exhibition Trust	134 17 0	3½ do. do.	184 15 0	143 0 0
Fothergill Trust	272* 7 6	3½ do. do.	374 0 0	280 0 0
Aldred Trust	154 8 0	3½ do. do.	210 17 6	164 0 0
Endowment Fund	394 7 0	3½ do. do.	525 2 3	418 0 0
"Trueman Wood" Lecture Endowment Fund	929 15 8	3½ do. Conversion Loan	654 18 0	1,002 0 0
Sir George Birdwood Memorial Fund	734 19 9	3½ do. War Loan	674 0 0	779 0 0
Russian Embassy Prize	100 0 0	3½ do. do.	91 9 3	106 0 0
Mann Trust	1,028 9 2	3½ do. do.	900 0 0	1,090 0 0
Thomas Gray Memorial Trust	9,047 18 9	3½ do. Conversion Loan	7,000 0 0	9,749 0 0
Art Congress Studentship	1,000 0 0	Canada 4 per cent. Stock 1940–60	1,000 0 0	1,040 0 0
	112 0 0	Bengal Nagpur Railway 4 per cent. Debenture Stock	112 0 0	114 0 0
	391 9 6	3½ per cent. War Loan	398 18 7	415 0 0
			£25,410 6 0	£29,870 10 0

SCHEDULE OF THE SOCIETY'S INVESTMENTS.

		Standing in the Books at a Value of
	Ground Rents (amount invested)	£10,091 14 0
£217 0 0	Great Indian Peninsula Railway 4 per cent. Guaranteed Debenture Stock	157 0 0
£500 0 0	Australia 4 per cent. Stock 1955/70	445 0 0
£100 0 0	Queensland 4 per cent. Stock	97 0 0
£530 10 1	New South Wales 5 per cent. Stock 1935–55	514 11 0
£500 0 0	Natal 4 per cent. Stock	445 0 0
£24 0 0	New River Company Stock	6 0 0
		£11,756 5 0

The approximate Market value of the above investments on December 31, 1935, was £11,841.

NOTICE

ANNUAL GENERAL MEETING

The Council hereby give notice that the One-hundred-and-eighty-second Annual General Meeting, for the purpose of receiving the Council's Report and the Financial Statement for 1935, and for the election of officers, will be held, in accordance with the Bye-laws, on Wednesday, June 24th, at 4 p.m.

(By order of the Council),

WILLIAM PERRY,
Secretary.

COUNCIL

A meeting of the Council was held on June 8th. Present :—Colonel Sir Henry McMahon, G.C.M.G., G.C.V.O , in the Chair ; Lord Amulree, P.C., G.B.E., K.C. ; Mr. Fred H. Andrews, O.B.E. ; Sir Charles H. Armstrong ; Dr. Edward F. Armstrong, Ph.D., D.Sc., F.R.S. ; Lord Askwith, K.C.B., K.C., D.C.L. ; Viscount Bledisloe, P.C., G.C.M.G., K.B.E. ; Sir Edward A. Gait, K.C.S.I., C.I.E. ; Sir Reginald Glancy, K.C.S.I., K.C.I.E. ; Mr. Ernest W. Goodale, M.C., Sir Reginald A. Mant, K.C.S.I., K.C.I.E. ; Mr. G. K. Menzies, C.B.E. ; Mr. John A. Milne, C.B.E. ; Mr. Oswald P. Milne, F.R.I.B.A. ; Mr. Tom Purvis, and Mr. Carmichael Thomas, with Mr. W. Perry (Secretary) and Mr. K. W. Luckhurst (Assistant Secretary).

The Chairman reported that His Majesty the King had graciously consented to accept the office of Patron of the Society, rendered vacant by the lamented death of His Late Majesty King George V (see *Journal* for May 27th).

The following candidates were duly elected Fellows of the Society :—

Ackerley, The Venerable Frederick George, M.A., Skipton, Yorks.
Aitken, William Francis, London.
Andrews, Egbert Arthur, B.A., London.
Ashfield of Southwell, The Right Hon. Lord, P.C., London.
Bain, Sir Ernest, K.B.E., LL.D., J.P., Harrogate, Yorks.
Bampton, Cyril Charles, Haifa, Palestine.
Bearman, Cyril Wallace George, Wellington, New Zealand.
Bergman, Carl Axel, Naraipore, Bihar, India.
Berryman, Sir Frederick Henry, D.L., J.P., Shepton Mallet, Somerset.
Borenius, Professor C. Tancred, Ph.D., D.Lit., London.
Boutflour, Robert, M.Sc., Cirencester, Glos.
Bowness, E. W., B.Sc., Calgary, Canada.
Brady, James Campbell, B.Sc., Prince Rupert, B.C., Canada.
Brown, Charles William, Higham, Rochester, Kent.
Brunwin, George Eustace, Rayne, Braintree, Essex.
Camm, Frederick James, Whitton, Twickenham, Middx.
Cran, Miss Marion, Benenden, Kent.
Cunynghame, Ian F., London.

Dallas, Captain Oswald, Penshurst, Kent.
Darlington, William Aubrey, London.
Davison, Mrs. Elsie Joy, Hooton Park, Cheshire.
Dearman, E. F., Knebworth, Herts.
de la Mare, Walter John, LL.D., D.Litt., Taplow, Berks.
Edinger, George Adolphus, London.
Evans, Bertram, London.
Fennemore, Thomas Acland, London.
Ferdinands, Charles Walter Vanden Driesen, Colombo, Ceylon.
Fleming, Nisbet C., Potterhill, Paisley.
Fletcher, James Young, London.
Freeman, Spencer, Purley, Surrey.
Galbraith, William, Gravesend, Kent.
Graham-Smith, Colonel Cyril, O.B.E., Poona, India.
Grant, Captain Horace Henry, Durban, Natal, South Africa.
Green, Richard Harry, Ashford, Kent.
Holbrook, Francis Ralph, Shipley, Yorks.
Jezic, Dr. Slavko, Zagreb, Yugoslavia.
Jowett, Percy Hague, A.R.C.A., London.
Kershaw, Joseph, Old Trafford, Manchester.
Kidd, Charles D., London.
Knowles, Vincent L., Natal, Brazil.
Knowles, William Plenderleith, M.C., M.A., D.Sc., London.
Lambert, Leslie Carlton, Bearsden, by Glasgow.
Lancashire, Albert Edward, Preston, Lancs.
Lindsell, A., Johannesburg, South Africa.
McAuslan, H. B., Rangoon, Burma.
Mackay, Ernest John Henry, M.A., D.Litt., Monks Risborough, Bucks.
Maybury, Sir Henry Percy, G.B.E., K.C.M.G., C.B., London.
Nepean, Miss Edith, London.
Ng Keng Siang, London.
Prince, Eric, Radlett, Herts.
Renner, Miss Margaret E., Johannesburg, South Africa.
Renton, Major A. F. G., London.
Ridgway, Ernest Frederick, Wrexham, N. Wales.
Rienaecker, Victor George Robert, Oxford.
Robinson, W. Heath, London.
Schuster, Leonard Walton, M.A., Hale, Manchester.
Smith, S. C. Kaines, M.B.E., M.A., Birmingham.
Steele, John Beaumont, Winnipeg, Canada.
Stephenson, Alan, B.Mus., Coventry.
Talbot, Sir William John, J.P., Walsall, Staffs.
Taverner, George Beauchamp Robert, London.
Thompson, Eric James, Bahrain Island, Persian Gulf.
Thomson, William John, Glasgow.
Tranter, Harold Leonard Egerton, Melbourne, Australia.
Voules, Sir Francis Minchin, C.B.E., London.
Wiginton, Robert, London.
Wilcock, Dr. Alfred William, Exeter, Devon.
Wooley, Lieut.-Commander Albert Edward, Bombay, India.

A letter from H.R.H. the Duke of Connaught, President of the Society, was read intimating his approval of the award of the Society's Albert Medal for 1936 to the Earl of Derby, K.G. (see *Journal* for June 5th).

The draft Report of the Council on the work of the Society for the year 1935-36 was amended and approved.

Mr. F. H. Andrews, O.B.E., was appointed to represent the Society on the British Committee of the International Congress on Art Education.

A quantity of financial and formal business was also transacted.

WEDGWOOD MEDALLION OF SAMUEL MORE

Dr. John Thomas, who alluded in his recent paper on "Pottery in England's Industrial History" to the friendly relations between Josiah Wedgwood and the Society of Arts, has since discovered a Wedgwood portrait medallion of Samuel More, Secretary of the Society from 1769 to 1799, whose features are familiar to all who frequent the Society's Lecture Hall from the excellent portrait which hangs at the head of the staircase. A replica of this medallion has been presented to the Society by Messrs. Josiah Wedgwood & Sons, Limited, who intimate that they can supply further copies to Fellows at a small cost. The modeller is unknown but the portrait seems to have been taken from an ivory carving, many of which Samuel More loaned to Josiah Wedgwood for reproduction.

A letter from More which accompanied various plaster casts (including one of the Society's seal) sent to Etruria for this purpose is extant, together with two others, extracts from one of which it may be of interest to quote :—

> "Adelphi, Octr. 14. 1775.
>
> You will probably smile my Dear Friend and was I at your Elbow I should laugh too at the Thought of what I have been employing my Attention about which is nothing more than to consider of preserving a Wash-Ball from growing damp & spoiling which they all do in the Manner they are at present kept, and I can only reconcile to my self the having employ'd my thoughts on such a Subject by considering that you are in some degree concerned in it—and *Nihil Wedgwoodianum a me alienum puto.* But to the point, As the Water which necessaryly sticks to the wash ball after it is used soaks into it, it by degrees spoils it to remedy this it is proposed that a Cup with a few holes in its Bottom should hang by its Rim within a Small Vase and when the Wash-ball is put in the Cup any Water will drain from it into the larger Vessell—Mr. Jennings to whom I mentioned this says he is sure a Contrivance of this kind would sell . . . There has lately been sent me from the Mosquito Shore some Specimens of Earths, Samples of which Mr. Cox has sent to Etruria, I shall be glad to hear your opinion of them that I may let my friend know whether it is worth his While to send any of them hither.
>
> The best Wishes of all here attend you, Mrs. Wedgwood and all our friends in Your Neighbourhood and I remain
>
> "Dr. Sir Your obliged and sincere Friend
>
> Addressed to SAML. MORE."
>
> Mr. Josiah Wedgwood
>
> Etruria, Staffordshire.

PROCEEDINGS OF THE SOCIETY

NINETEENTH ORDINARY MEETING

WEDNESDAY, 22ND APRIL, 1936

SIR RICHARD HOLT, BT., Chairman, Elder Dempster Lines, Ltd., in the Chair

THE CHAIRMAN, in opening the meeting, said :—It is my pleasant duty this evening to introduce to you Admiral Douglas, though I suspect that he does not require any introduction. He has had a very distinguished career in the Navy, and was at one time hydrographer. His interest in the Port of Liverpool is that he is the Acting Conservator ; that is to say, that he gives technical advice about the river, from the point of view of preserving the navigation, to the Conservators, who are now the Ministry of Transport. For instance, if any one wants to put a pier in the River Mersey, he must obtain permission of the Conservators before it can be done, and they must satisfy themselves that it is going to be put in the right place. Admiral Douglas advises them on such a point and he is, therefore, well qualified to speak on this subject.

Probably most of you do not know that Liverpool is a very old town. It was given a charter of incorporation by King John, but all vestiges of the past have disappeared. We had a castle which had two or three sieges during the Civil Wars, but that has gone. The ordinary person might therefore think that Liverpool is a modern town, but we are simply trying to straighten out things which remain from its antiquity. Liverpool is now most famous for its docks, which do a large trade and would be glad to do a great deal more.

The following paper was then read :—

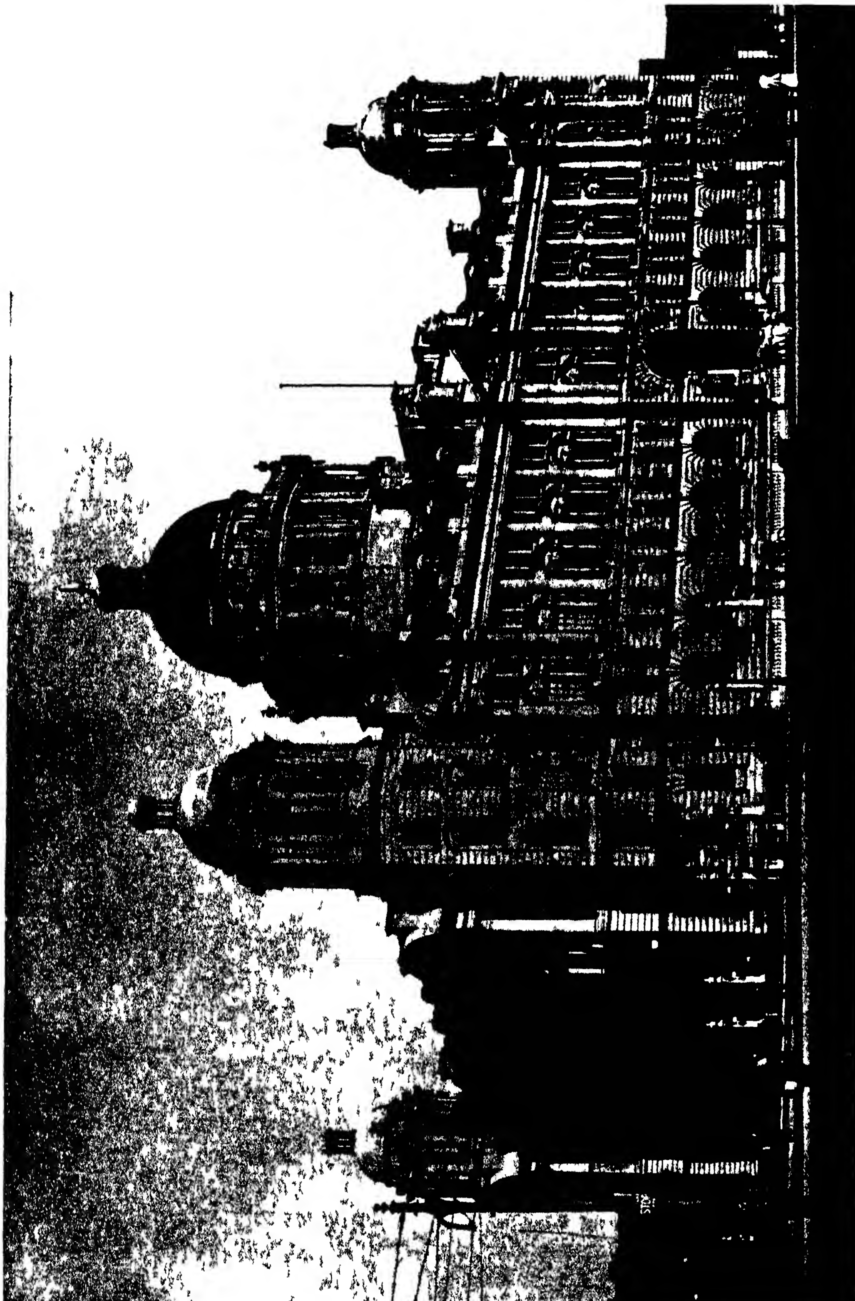
THE PORT OF LIVERPOOL

By VICE-ADMIRAL SIR PERCY DOUGLAS, K.C.B., C.M.G.

In the year 1207, eight years before the Magna Charta was signed, King John granted a Charter to the Borough of Liverpool, which was then but a village with only a small trade with Ireland and nearby creeks and havens. Salt had been found in Cheshire and this probably was the chief article carried by the small vessels leaving the Mersey in those early days.

There is a print of Liverpool in 1650, when Charles II was king, showing the castle (where Queen Victoria's statue now stands at the south end of Castle Street), the old church (St. Nicholas'), the town hall and a few scattered houses. It was about this time that Liverpool became a free and independent port. Previously Liverpool had always been subject to the much older port of Chester. The sea trade of the port was slowly growing and in the year 1648 Liverpool received as much as 30 tons of tobacco in one ship, which must have been a large quantity in those days, even though it was 50 years since Sir Walter Raleigh had introduced tobacco into England after one of his famous voyages.

About the beginning of 1700 and onwards there were many complaints from



Mersey Docks and Harbour Board Offices

shipowners that the vessels visiting the port were constantly being damaged when at anchor in the river, as there was not any shelter against the storms and strong tides. There were no docks in those days, and as the ships were only small sailing vessels, they were very difficult to moor safely in a wide river with many sandbanks and not properly charted.

In the reign of Queen Anne it was decided to build a closed dock in Liverpool, and this the engineers of those days did in much the same manner as the great Gladstone Dock of to-day was built. A wall was built as far out into the river as was possible and side walls were erected, thus enclosing an area in which, by means of dock gates, water could be retained when the tide fell and filled up again when the tide rose. The gates could also be opened for allowing ships to enter and leave the dock at high tide. Thus, in 1715, the Old Dock, which was the first enclosed commercial dock ever built, was opened for trade. Compared with present-day docks this first dock was a very humble affair, its water area being only three acres. Ever since the Old Dock was built, dock after dock has been built in Liverpool, so that to-day the port has probably the finest closed dock system in the world.

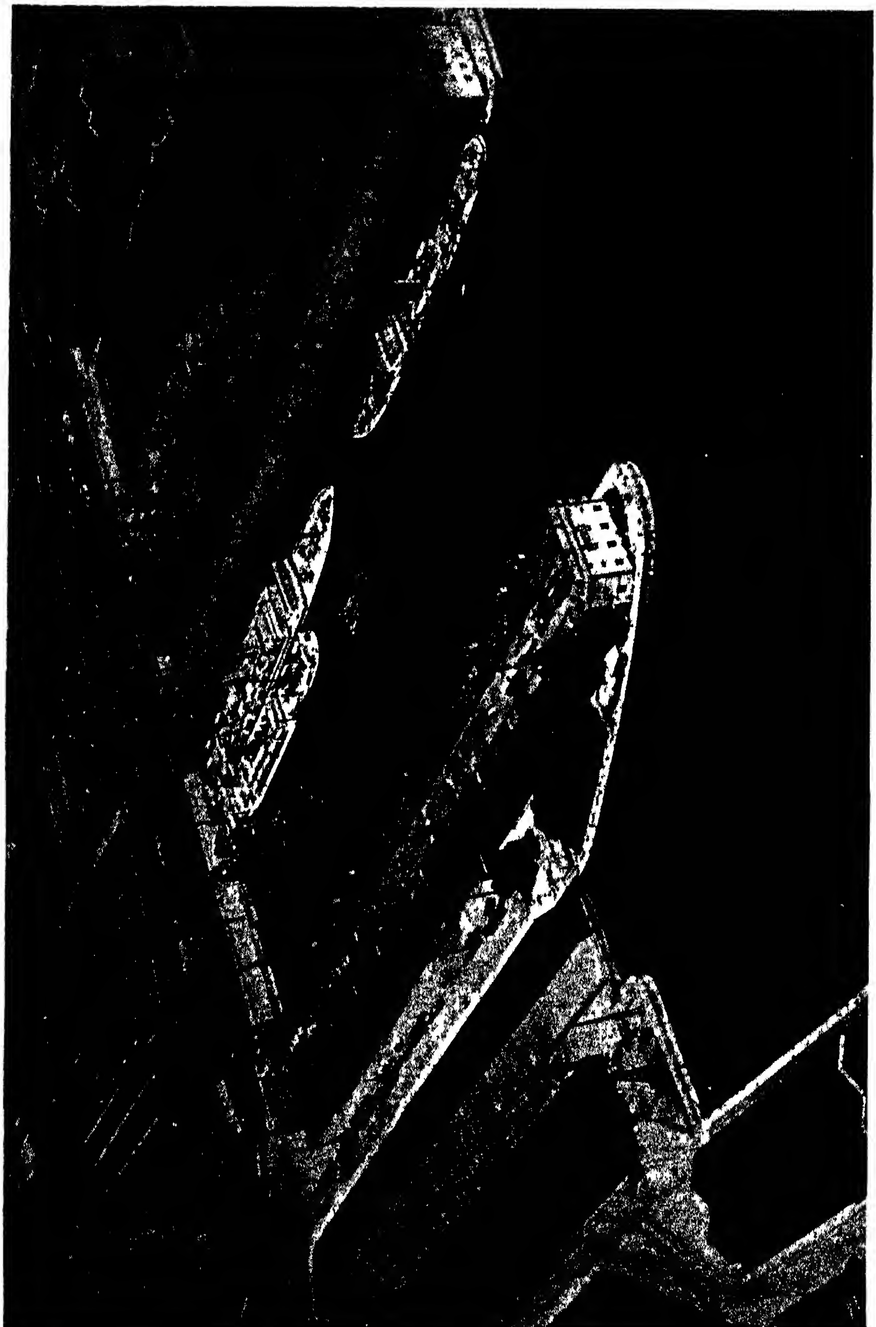
After the Napoleonic wars England developed very fast as the first great industrial nation in the world. Cotton had come to Liverpool before then, but it took some years before its manufacture was firmly established in Lancashire, and then cotton became the chief import of Liverpool. Mills were built all over the county and great numbers of workpeople were employed, while large quantities of coal were required and the mining population increased accordingly. Then the railways came and more and more people were collected together in the industrial areas. Home supplies of food became insufficient, the imports of raw materials from overseas increased, goods made in this country were sold overseas, so more ships were built and all these increasing demands of a growing population led to a constantly increasing port of Liverpool.

The Mersey Docks and Harbour Board is now the authority which controls the working of the port, and their estate also includes the docks on the Birkenhead side of the river. The Docks and Harbour Board consists of a Chairman and 27 members, and the principal officers, 17 in number, include the General Manager and Secretary to the Board. The Board meet weekly and, in addition, there are nine committees, most of which meet weekly.

THE DOCKS

Let us now look at the picture of the port as it is to-day. All the docks on the Liverpool side, of which there are ninety in number, have been built on the river front and stretch for a distance of 6½ miles. They are bordered on all sides by quays, and on the majority of the quays sheds or warehouses have been built for the reception and housing of various cargoes from all parts of the world.

Running parallel with the docks is a long stretch of road often referred to as "the great Dock Road." This road is more or less a barometer of the trade of the port. In busy times an endless stream of motor lorries and horse-drawn carts can be seen



THE GLADSTONE DOCKS.

on this road, loaded with cotton from America, Egypt, East and West India, East and West Africa, etc., tobacco from America and South Africa, sugar from Cuba and the West Indies, timber from every continent, fruit from America and the Dominions of Canada, Australia, New Zealand and South Africa, grain from Canada, Australia, South America and Russia, and the thousand-and-one articles used in everyday life. These various articles are either being taken by motor or other vehicles to the large inland towns or to some of the twenty-four great railway goods stations adjoining the docks. Carts and railway trucks will also be observed laden with heavy machinery, motor-cars, locomotives, cotton piece goods, etc., representing mainly the manufactures from the factories in Lancashire, Yorkshire and Cheshire which are being exported to foreign countries.

Travelling in a southerly direction the first dock system to be seen is the Gladstone, which was completed in 1927. The docks at the north end of the city are larger in construction than the older docks which will be seen in the centre of the town, and the Gladstone system of docks previously mentioned are the most modern in this respect.

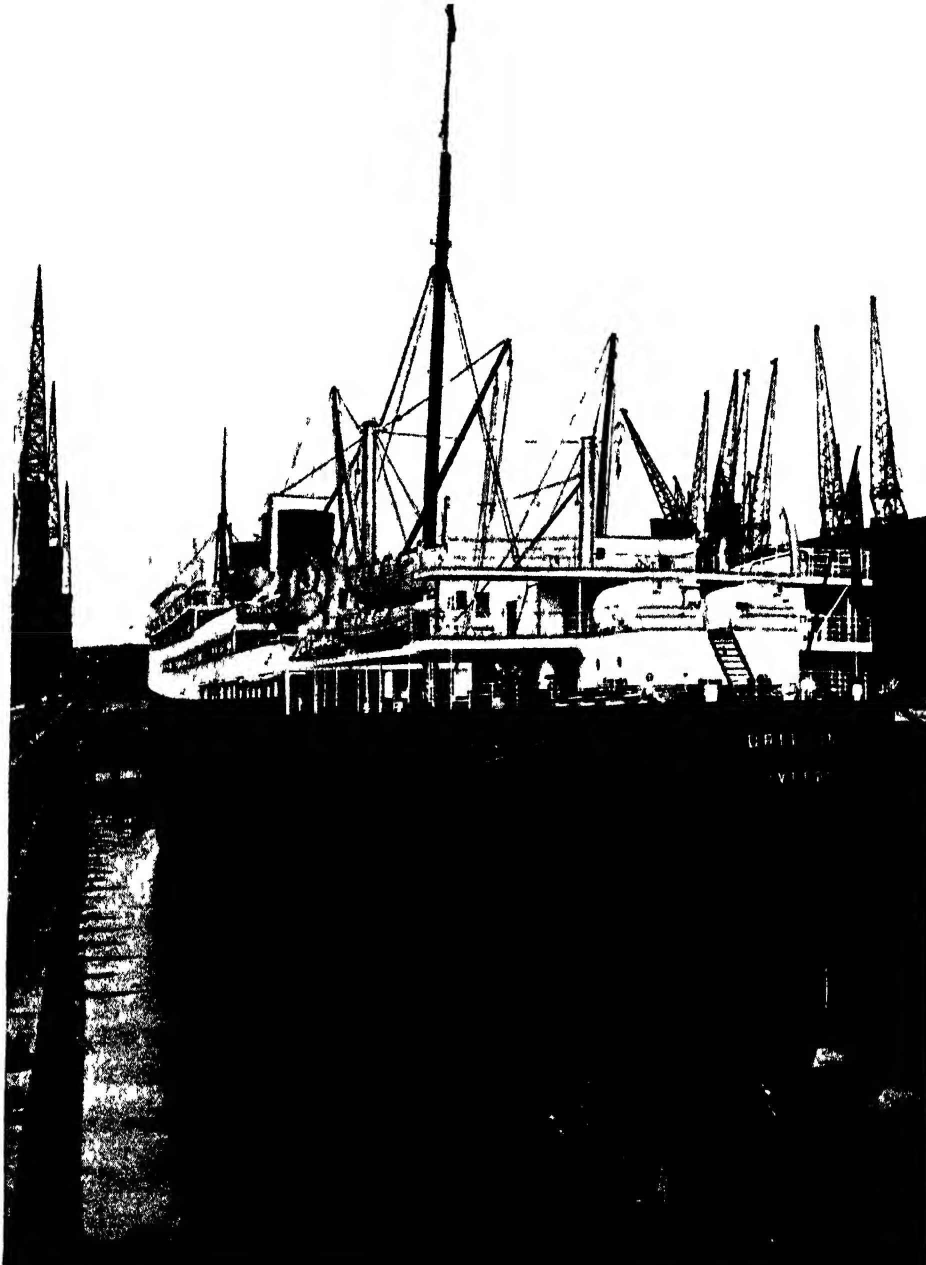
The first wet dock is the Gladstone Graving Dock. As will be seen from the picture it is a part of this great system and it has a shed and cranes on its north side for the reception of cargoes on the occasions when it may be required as a wet dock, or when it may be necessary for a vessel to discharge cargo whilst undergoing repairs. This dock formed the first part of the Gladstone Dock scheme, the other docks in the system being built later on. The length of the dock is 1,050 feet, a much greater length than any vessel using the port.

The next docks to be seen are the Gladstone Branch Dock No. 2, the Branch Dock No. 1 and the Gladstone Dock itself, with the large river entrance and its immense steel gates. The lock is a wonderful piece of engineering and has proved to be a great advantage to the ships using the Gladstone Docks, and many of the older docks at the north end of the estate. The tide rises and falls in Liverpool from 20 to 31 feet twice per day, and before this river entrance was made vessels which came into the river after tide time had to wait until the next tide before they could get to their berth. This meant a loss of valuable time, but by using the new river entrance at the Gladstone Dock large vessels can get into or out of dock at any time of the day except for the two hours each side of dead low water.

From the Gladstone system of docks to the Liverpool landing stage there is a series of thirty-four wet docks with transit sheds and eight graving docks, and I propose referring to the landing stage later.

Going south from the stage we come to another system of docks which contains Liverpool's older docks, notably the Canning Graving Docks, built so long ago as 1765, and still in use. As before stated there is a total of ninety docks. The estate to-day consists of :—

658 acres of enclosed water.
38 miles of lineal quays.
1,443,530 square yards, or approximately 300 acres, of transit sheds.



M.V. *Britannic* IN GLADSTONE DRY DOCK.

23 coaling hoists, cranes and conveyors—capacity 300–500 tons per hour.
11 hydraulic pumping stations.
6 impounding stations.
5 electric substations. (N.B.—Electricity received from Corporation.)
11 river entrances.
18 dry docks.

Warehousing for—
180,000 casks of tobacco.
47,000 tons of grain.
80,000 tons of general goods.

(N.B.—The Board does not compete with outside warehouses, but rather provides special accommodation for commodities which require it.)

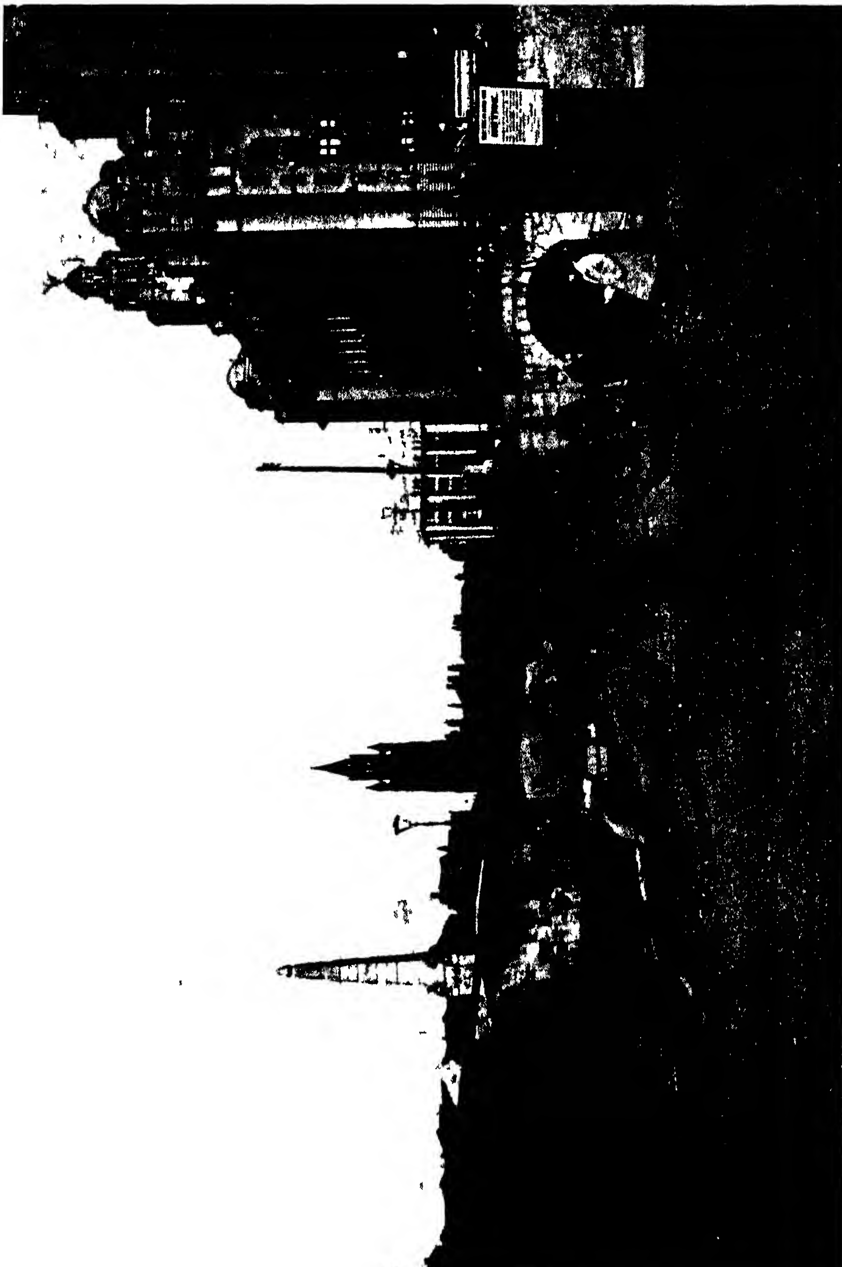
Lairages with covered accommodation for—
6,771 oxen.
22,000 sheep.
3 dockyards for the Engineer.
1 buoy store for the Marine Department.
3 floating stages.
Railway passenger station.
2 Customs baggage rooms.
Covered accommodation for 6,000 coastal passengers.
2 jetties for discharge of oil.
118¾ miles of railway lines.

In addition, the Board maintains a fleet of dredgers, surveying boats, salvage vessels, lightships, pilot boats, and other necessary floating plant.

On the Liverpool side of the river the estate stretches some 8 miles north and south, with the dock offices in the centre, and on the Birkenhead side, the Birkenhead docks, which are also under the control of the Port Authority, have been constructed inland for a distance of about 3½ miles. It is at Birkenhead where the largest of the Merseyside flour mills are situated and there should also be mentioned, to the southward, Cammell Laird's shipbuilding yard; Bromborough Docks, with the well-known Port Sunlight; and Eastham Locks, the entrance to that wonderful waterway, the Manchester Ship Canal.

LANDING STAGES

One of the most interesting places to visit in the port of Liverpool is the Prince's and George's landing stages on the Liverpool side of the river. The original stage was constructed about 1850, but this was destroyed by fire in July, 1874, when the present one was built. The total length of the stage is 2,534 feet by 80 feet wide. In consequence of the considerable rise and fall of the tide it is a floating structure, carried on about 200 pontoons. The stage is held in position by a number of bridges and booms which are connected with the shore and stage by swivel joints and by mooring chains, the shore ends of which are in the river wall. The level of the deck of the stage is about 6 to 8 feet above the water. There is a floating roadway, 550 feet in length and 35 feet in width, with two tracks for heavy vehicles and two passenger footways, giving an easy incline at all states of the tide.



The Floating Roadway, Liverpool Landing Stage.

To meet the requirements of the different classes of traffic the stage is divided into three portions, Prince's stage, Ferry Goods stage and George's stage. On different parts of the stage, buildings and offices have been erected for shelter sheds, post, telegraph and telephone offices, refreshment rooms, customs examining rooms, shipping offices, etc.

The northern portion is the Prince's stage, 1,521 feet in length, which is used by transatlantic and other passenger steamers, steam tenders and tugs. Northward of the regular liner berth are berths for the Isle of Man and North Wales pleasure steamers, not boats of the kind one usually thinks of as pleasure steamers, but vessels of 23 knots, 2,000 tons, carrying 2,000 to 2,500 passengers—such beautiful craft as the famous *Ben-my-Chree* of the Isle of Man Steam Packet Company, and the *St. Tudno* of the Liverpool and North Wales Steamship Company, vessels larger than the Atlantic liner of a few years ago. During the busy season as many as sixteen Isle of Man steamers sail and arrive in one day, as well as two and sometimes three North Wales steamers. The last of these steamers usually arrives about 7.30 p.m. and then another class of vessel requires the stage—the Dublin and Belfast steamers. The Belfast service is carried on by the *Ulster Queen*, *Ulster Monarch* and *Ulster Prince*, Diesel-engined vessels of 3,750 tons, with speeds of nearly 20 knots ; the Dublin service is run by the *Lady Connaught*, *Lady Munster* and *Lady Leinster*. Both the Belfast and Dublin steamers regularly arrive at 7 a.m. and sail at 10 p.m., and a passenger may make the journey from Ireland to London and back in less than 36 hours, with five hours in London to do business. This part of the landing stage is thus in constant use from 7 a.m. until 10 p.m. nearly every day.

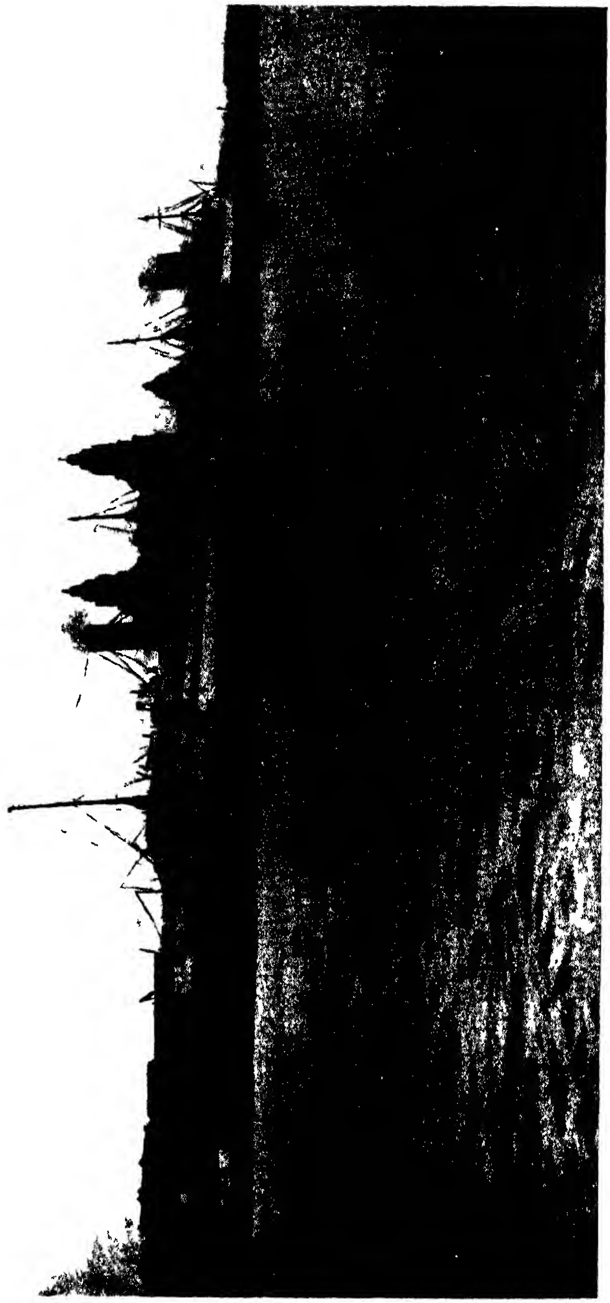
The Ferry Goods stage, 317 feet in length, is connected to the shore by the floating roadway, and vehicles of all descriptions go to and from Birkenhead and Wallasey.

George's ferry stage, 696 feet in length, is used by passengers to and from Birkenhead and Wallasey.

On the Cheshire side of the river are the Seacombe, Egremont and New Brighton Ferry landing stages, which belong to the Wallasey Corporation and serve the Wallasey Ferry steamers ; the Rock Ferry landing stage which belongs to the Birkenhead Corporation and serves the Rock Ferry steamers ; Woodside landing stage which belongs to the Dock Board and serves the Birkenhead ferry steamers. Also, adjacent to the Mersey Cattle Wharf on the Cheshire side of the river is the Wallasey landing stage, which belongs to the Dock Board and provides berthage for ocean-going and coastal vessels landing cattle and sheep, as does the northern portion of the Woodside landing stage.

FERRY SERVICE

I wish now to describe the ferry service which is so vital a factor in the life of Liverpool and the Cheshire shore, and a description of the ferries from the earliest day to the present cannot fail to be of interest.



Liners at Liverpool Landing Stage (Prince's).

Birkenhead Ferries

The history of the Mersey ferries commenced about the year 1332, when Edward III, by a Charter, granted to the Prior and Convent of Birkenhead the right to carry passengers and horses across the river. The Priory enjoyed its many privileges until the Dissolution, when Henry VIII in 1545 conveyed the ferry rights to one of his favourites, Ralph Worsley. Eventually the ferry became known by the name "Woodside," and its Birkenhead terminal established at a point some yards northward of that used by the monks. In 1842 the perpetual right of the ferry was purchased by the Birkenhead Improvement Commissioners, and ultimately came into the possession of the Borough of Birkenhead. In 1897 the Birkenhead Town Council purchased the Rock and New Ferries, which lie about two miles south of Birkenhead.

Wallasey Ferries

The earliest reference to a Wallasey ferry service appears in the archives relating to the Accounts of the Exchequer of Henry VIII, 1515. No organized service appears to have existed until the early part of the nineteenth century, when three ferries were operated, and in 1845 the local parish council obtained powers under the Wallasey Improvement Act to hire or take on lease the various ferries and, if thought expedient, to purchase and take absolutely the Seacombe and Egremont Ferries. Similar powers to acquire the New Brighton Ferry were obtained in 1858, and this was the year when the present Ferries Department of the Wallasey Corporation began.

With the rapid development of the Wirral peninsula as a residential area it became necessary to provide larger and improved types of ferry steamers, culminating in the present efficient fleet, the largest steamer of which has a carrying capacity of 2,000 persons. During the war two of the Wallasey ferry steamers, the *Royal Iris* and the *Royal Daffodil* took part, with H.M.S. *Vindictive*, in the attack on the Mole at Zeebrugge.

Control

The ferries plying between Liverpool, Birkenhead (Woodside) and Rock Ferry are under the control of the Birkenhead Corporation. Those which ply between Liverpool, Seacombe, Egremont and New Brighton are controlled by the Wallasey Corporation.

To me, as a seaman, the actual navigation of these ferry steamers nowadays is of the greatest interest, and I do not know of a similar method or such meticulous work anywhere. The captain and the mate, who is the helmsman, are not in the same chartroom or wheelhouse. The helmsman is in the wheelhouse amidships, the master is in either of two small houses on a flying bridge, one house being on the port and one on the starboard side. Each house is fitted with telegraphs, and the master moves across the bridge from side to side according to which side of the vessel is berthing at the stages.

The master is, of course, in charge of the vessel, but so skilful are both men that it is rarely necessary for the master to give orders to the helmsman who steers the vessel across the river and to her berth, the master governing the speed. The berthing space at the part of the landing stage known as the George's stage for the passenger ferry steamers is 696 feet. The gap between each allotted berth is only 10 feet at either end, so that the steamers only have their own length, 158 feet, plus 20 feet, in which to berth in strong winds and during spring tides (4 knots), yet there is rarely an accident.

Frequency of Service

The Birkenhead Corporation ferries maintain a passenger service :—

Between Liverpool and Birkenhead (Woodside)	every 10 minutes
,, ,, ,, Rock Ferry	,, 20 ,,

The Wallasey Corporation maintain a passenger service :—

Between Liverpool and Seacombe	every 10 minutes
,, ,, ,, New Brighton (winter)	half-hourly
,, ,, ,, New Brighton.. ..	every 20 minutes calling at Egremont (summer).

A limited all-night service is maintained between Liverpool and Birkenhead and Liverpool and Seacombe.

Time Taken to Cross

The passage from Liverpool to Birkenhead (Woodside) and Liverpool to Seacombe	5 to 7 minutes.
,, ,, Rock Ferry	15 minutes.
,, ,, New Brighton (calling at Egremont)	25 minutes.

Number of Steamers on Service

Two to Woodside and two to Rock Ferry.
Two to Seacombe and two to New Brighton.

Methods of Embarkation and Disembarkation

As soon as a ferry steamer berths at the stage, three gangways, each capable of taking about five people abreast, are lowered simultaneously, one to the upper deck and two to the lower deck of the steamer. The passengers to be embarked wait behind barriers on the stage clear of the gangways until those on the steamer have disembarked. By these means passengers can be disembarked and embarked during the rush periods in about three minutes.

Punctuality of Service

Except during dense fog, when only the Birkenhead (Woodside) and Seacombe services are running, the ferry steamers maintain a schedule time to connect with the Scottish Railway services.

Fog

In dense fog the ferry services are run between Liverpool and Birkenhead (Woodside) and Liverpool and Seacombe—the usual practice being for each service to be run by three steamers, one of each service being on passage, one of each service at the Liverpool landing stage and one of each service at the Cheshire side of the river. As soon as the steamer on passage comes within hailing distance, the steamer at the stage proceeds on her journey across the river.

Number of Passengers Carried

During the year ended March 31st, 1935, the following passengers were carried on the respective ferries, viz. :—

Birkenhead—	
Woodside	12,252,480
Rock Ferry	979,184
Wallasey—	
Seacombe	21,103,484
Egremont	1,664,100
New Brighton	4,578,516
	40,577,764

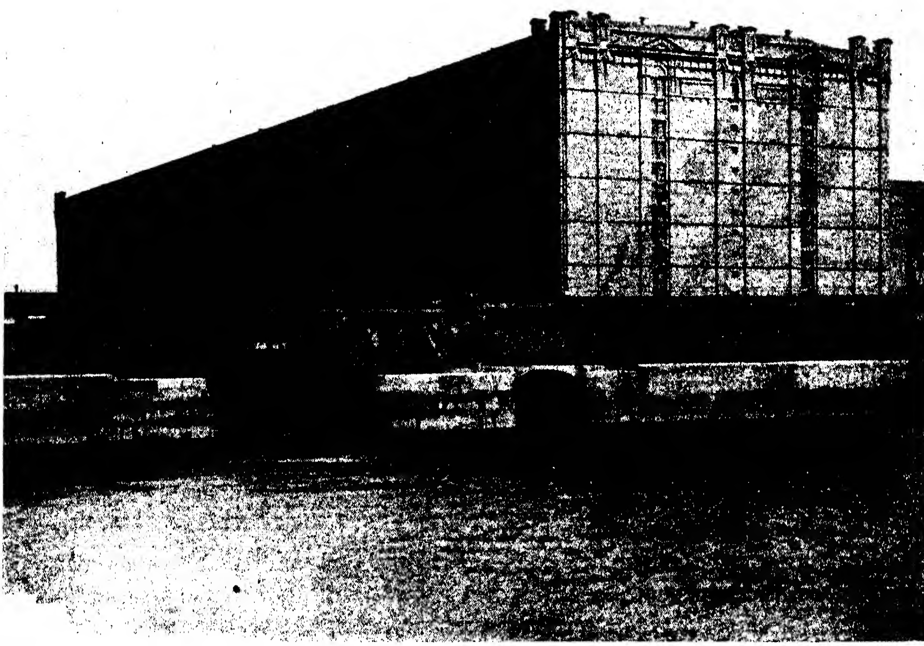
In addition to the passenger ferry steamers there are four luggage ferry steamers, two between Birkenhead and Liverpool, owned by the Birkenhead Corporation, and two between Seacombe and Liverpool, owned by the Wallasey Corporation. They berth at the Ferry Goods stage (317 feet in length) which is just north of the passenger berth at the landing stage. The length of these vessels is 150 feet and they are each fitted with four gangways of the drawbridge type, two on each side of the vessel, which are lowered to enable vehicles to embark and disembark. The vessels, which are fitted with twin screws both at the bow and stern, will each carry about forty vehicles. The vehicles arrive and depart from the landing stages by means of floating roadways built on pontoons, which afford an easy incline at all states of the tide.

Prior to the opening of the Mersey Tunnel in 1934 the luggage steamers belonging to the Birkenhead and Wallasey Corporations ferried over one and a quarter million vehicles across the river each year. Since the opening of the tunnel, however, this number has been considerably reduced, although horse traffic must still use the ferries.

STORAGE AND WAREHOUSING

Oil Storage

The storage tanks at Liverpool occupy about 40 acres of land and have been erected by the various oil companies for the storage of fuel oil and petrol. The tanks vary in size and hold from 3,000 to 10,000 tons each. At the river face of this land two jetties or piers, known as the North and South Dingle Jetties, have been constructed, at which the steamers, discharging the fuel oil and petrol, berth. The



Stanley Dock Tobacco Warehouse, Liverpool.

oil is then pumped by the special pumps on board the steamer through huge iron pipes into the tanks, where it is later refined before being sold for commercial use.

The total storage accommodation is as follows :—

Provided by the Board :

60 magazines, capacity 60,000 barrels,
5 tanks ,, 12,500 tons ;

Provided by oil companies :

26 large tanks and some small subsidiary tanks, capacity 139,100 tons ;

and at Birkenhead there is tank storage for 50,500 tons.

Warehouses

There are at Liverpool some noteworthy warehouses for the accommodation of cargoes, etc., and amongst these are 28 blocks belonging to the Board with a quay frontage of 8,863 feet. The Board has storage also for 60,000 tons of grain, approximately half of which is on the Liverpool and the other half on the Birkenhead side of the river. Of others may be mentioned the Stanley Tobacco Warehouse, the largest in the world, capable of accommodating 75,000 casks of tobacco on 12 storeys or floors, with a basement. The value of the average stock carried, including duty, is some £30 million. There is also the East India Wool Warehouse, having a storage capacity of some 160,000 bales of wool.

Cattle Traffic

This is considerable, and at the Mersey Cattle Wharf, Birkenhead, the Board has accommodation for some 6,700 oxen and 22,300 sheep.

NAVIGATIONAL SUPERVISION

I have spoken briefly of the docks, traffic and trade, and now I will endeavour to interest you in the maintenance and control of the river and its approaches from the maritime point of view.

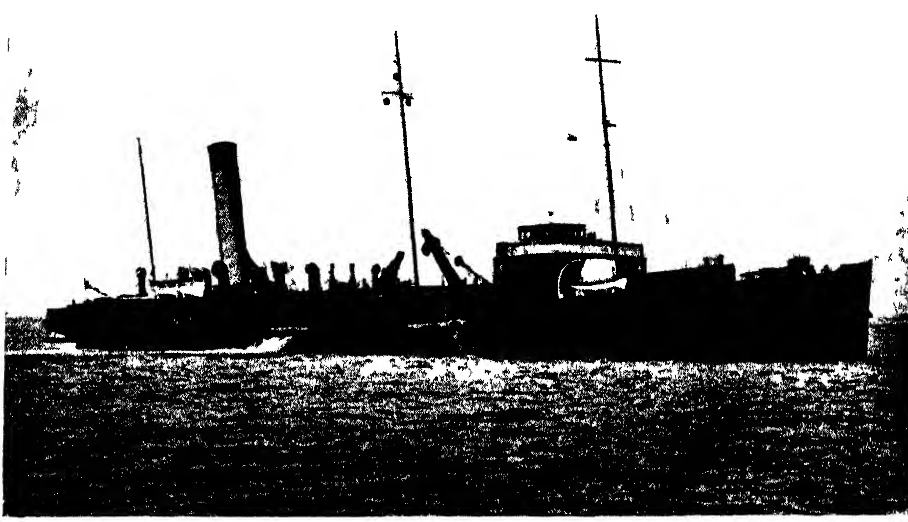
The Marine Surveyor and Water Bailiff is responsible for the control of all traffic in the river, and the periodical surveys of the dock entrances, rivers and channels, including the preparation of the charts showing the changes in the soundings. He is responsible also for the lighting and buoying of the channels and the control of the lighthouses and telegraph stations round the coast in the vicinity of the Mersey, the removal of wrecks in the river and the working of the landing stages and the riverside station, the latter having been erected by the Board near the Liverpool landing stage so that passengers can practically step from train to steamer or *vice versa*.

This officer has three assistants for the surveying, salvage work, etc., a stage master who looks after the stations and landing stages, and a number of surveyors, draughtsmen, assistant stage masters, masters of tenders, etc.

The work of dredging in the channels, etc., is the responsibility of the engineer-in-chief, who arranges the dredging operations from information as to the changes, etc., supplied by the Marine Surveyor. Whilst on the subject of dredging, a few figures as to what is entailed in the Mersey cannot fail to be of interest.

The Board's dredging plant consists of: five self-propelling sand pump dredgers, the largest of which is of 10,000 tons displacement and called the *Leviathan*, the other four being all of 3,500 tons, three self-propelling bucket-ladder dredgers, seven self-propelling grab hopper dredgers, and 19 self-propelling hopper barges. When I tell you that the average quantity of silt and sand removed annually during the ten years ending 1st July last was 15,588,250 tons, you will appreciate the necessity for this large dredging plant.

Mention must also be made of the floating cranes for heavy lifts which are used at Liverpool instead of fixed cranes on the quays (with one exception at Birkenhead), and which are also under the engineer-in-chief. It suits the shipowners far better to bring the crane to the ship than *vice versa,* for to move large vessels in the docks may be costly and undesirable, but with a self-propelled floating crane the lift can be picked up at many points in the docks handy for this or that railway station, coastal vessel or berth and be brought alongside the vessel required to receive



SAND PUMP DREDGER, *Hilbre Island.*

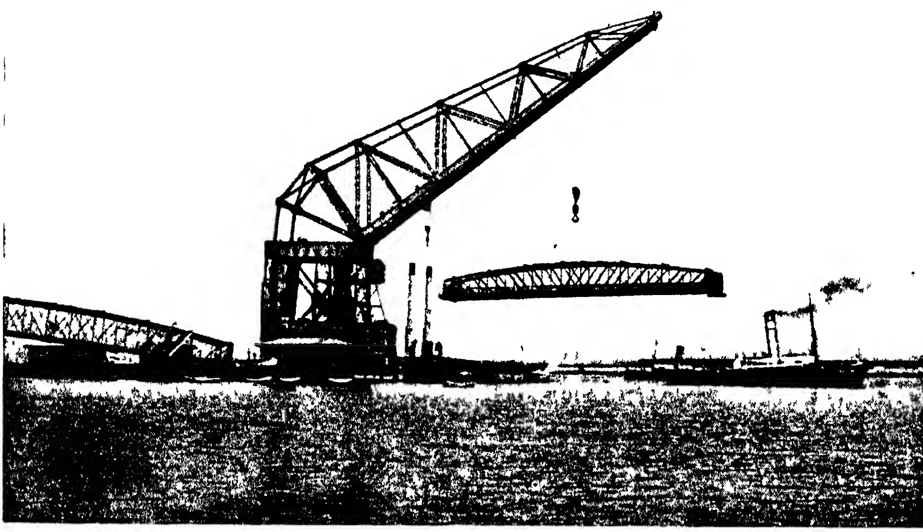
it. Moreover, such cranes may be of great value for salvage purposes. The Board operates five floating cranes with lifts of 25, 30, 50, 100 and 200 tons, respectively.

To return to the responsibilities of the Marine Surveyor and the navigational aids, etc., under his jurisdiction, it must first be appreciated that the approaches to the port from the sea are of paramount importance; by constant dredging and by building certain revetments and training walls there is now a minimum depth of about 24 feet L.W.S.T. over the bar and in the main approach channel to the port.

The entrance channel to the main Mersey channels is marked by red conical buoys on the starboard hand entering, and black boat beacons on the port hand, twenty-four on the port side and twenty-six on the starboard side in a distance of about 12 miles. All the beacons and the more important buoys carry their lights

30 feet above water, so that they are easily visible from the bridge of a large vessel. All are lighted, the illuminant being dissolved acetylene, and at night the channel has the appearance of a broad street.

There are three lightships at salient points in the channel, the most important, of course, being the Bar lightship, which is one of the most powerful and best equipped lightships in the world. She is actually a vessel with a lighthouse built on her, the illuminant being incandescent vaporised petroleum through lenses, emitting a total



FLOATING CRANE *Mammoth* (200 TONS).

ray of 40,000 candles. She has an electric submarine oscillator and a fog siren, the latter actuated by compressed air. The submarine oscillator sends out under-water signals which can be heard by ships at a distance of about 20 miles. She is also fitted with a wireless beacon which sends out aerial signals having a minimum range of about 50 miles. During foggy weather, synchronous wireless beacon and oscillator signals are transmitted. These signals enable her position to be located in fog so that vessels fitted with receivers can approach the port with confidence, thereby saving valuable time.

Each lightship, the dock office and one of the Board's salvage and surveying tenders has a radio transmitting and receiving set, so that they are enabled to report the movements of buoys or changes in soundings in the channels and the arrival

and departure of vessels, and to pass orders from owners to their vessels, inward and outward, which, of course, facilitates business.

The Board own and manage four lighthouses, Point Lynas, Orme's Head, Rock and North Wall. Point Lynas lighthouse, off the Anglesey coast, is 52 miles distant from the harbour, and is the station for the outer or western pilot boat. It is also a signal station in direct communication with the dock office for reporting vessels, etc. Of the four lighthouses this is the only one which is manned, the Orme's Head, Rock and North Wall being unmanned, their acetylene cylinders being replaced every twelve months. The lighting apparatus on these three unmanned stations is fitted with the ingenious device known as the "light valve," which automatically turns the gas on every evening and off every morning, leaving only a small pilot light burning during the day.. Making three out of four lighthouses unmanned during recent years, has, of course, saved personnel and is an economy in the working of the port.

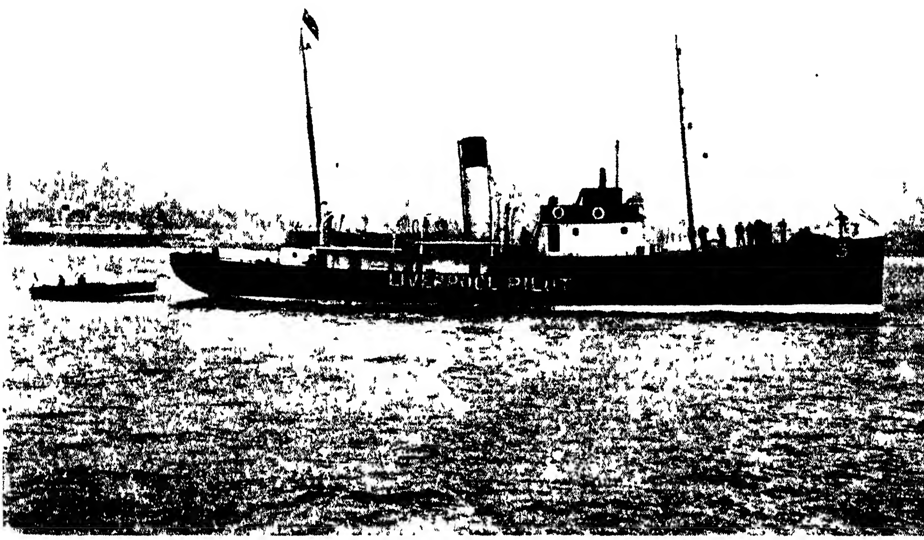
Each year, for the information of navigators, the Board publish a chart of the River Mersey and Liverpool Bay. The main channel from the Bar to Liverpool and the entrances to the Liverpool and Birkenhead docks are surveyed each month for the special information and guidance of the Board in their consideration of the important problems as to the best method of dredging and constructing training walls to provide as straight and as deep an entrance channel as possible to facilitate the navigation of the 36,000 vessels which annually enter and leave the port.

As regards the actual hydrographic surveying of the river there are two steam tenders, one steam launch and four motor launches in use for this purpose Both steam tenders are fitted with echo-sounding gear of the British Admiralty pattern, which has proved most useful. Echo sounding is undoubtedly one of the greatest helps to the surveyor in the present day. By suitable amplification of the echo and mechanical means he can obtain on a paper roll a record of the sea bottom beneath his vessel, somewhat like the record made by the recording barograph.

No description of the Board's responsibilities would be complete without reference to a very important duty, namely, the salving or removal of vessels which have become an obstruction to the navigation of the port or the sea channels leading thereto. This work is in the hands of the Marine Surveyor and Water Bailiff. Under Acts of Parliament he is authorised to take over completely any vessel, together with its cargo, which becomes an obstruction to navigation. After paying the Board's expenses in the matter, the residue of the values salved is handed over to those legally entitled to it. This is an admirable arrangement, provided the Board's expenses are recoverable, but not infrequently the salved portions of ship and cargo have so little value that the Board does not receive sufficient to pay for out-of-pocket expenses. The Marine Surveyor's Department possesses very efficient salvage appliances, and some of you present will probably be aware of the splendidly successful efforts made in the salving of the *Lochmonar*, *Seminole* and *Varand*.

PILOTAGE SERVICE

Management by the Board and their staff also includes all the pilotage service, for the Board is the pilotage authority. There are four very fine steam pilot vessels, and all pilots are trained up in the service. Starting as boat hands they form the deck crew of the pilot boats and as boat hands have to perform 18 months' foreign-going sea service and obtain a second mate's certificate. When qualified to act as pilots, generally at about the age of 24 years, they are graded as third-class pilots, and work their way through the second grade until they become first-class pilots.



MERSEY PILOT BOAT.

My talk will end with a few notes and remarks on the present-day work of the Bidston Observatory, now known as the Liverpool Observatory and Tidal Institute.

The Director of the observatory has charge of the taking of all astronomical and meteorological observations, the communication of time to the port and the testing of chronometers for the Merchant Navy. He also makes the necessary electrical connection for the firing of the 1 p.m. gun from the Morpeth pierhead.

The tidal work carried out at the observatory may be briefly described. This consists of tidal analyses and predictions, the Hydrographic Department of the Admiralty being the principal authority to whom predictions are supplied. During the year 1935, 75 sets of predictions were prepared and there was a considerable increase in the number of analyses made. This work requires much scientific

knowledge and preparation, and the staff consists of a Director, Associate Director, Principal Assistant and six assistants. I can assure you it is a full-time job for all.

There was also established in 1934 the invention of the Associate Director, an electric-recording tide gauge, which records continuously the height of the tide on the west side of the River Mersey at the Alfred Docks entrance, a distance of 2½ miles from the observatory. The Governing Committee of the Observatory and Tidal Institute consists of six members appointed by the Mersey Docks and Harbour Board and six by the University of Liverpool—twelve in all, with the addition of a Secretary and Accountant.

The obligation to maintain the observatory was imposed upon the Board by the Act of 1857, *i.e.*, the Act under which the control of the whole of the docks at Liverpool and Birkenhead was vested in the Board.

I have attempted in the brief time at my disposal to give you a sort of running commentary of Liverpool, the Mersey and the surrounding area, and my talk has naturally been very diversified. I have tried to keep away from figures as much as possible and interest you in a more general description of the docks, traffic, navigation, work afloat and the observatory. But many will perhaps say, what is Liverpool's position as a port ? Answering them, I would reply—

Liverpool is the first export port of the United Kingdom, and is the second import port. It is indeed so much the leading port of shipment that the value of its exports in produce and manufactures of the United Kingdom is almost 29 per cent. of the total and some £12½ millions more than that of London.*

The exports at the port of Liverpool are principally the manufactures of that vast "Industrial England"—Lancashire, Yorkshire and the Midlands—which it so adequately serves. Moreover, Liverpool has established its claim to the title, "The Gateway to the West." The port has without doubt the finest complete dock system in the world, and is in the position to serve the most populous districts, with their enormous wealth and manufactures, possessing as it does every facility for a large passenger as well as a great import and export trade.†

DISCUSSION

THE CHAIRMAN, in opening the discussion, said :—The lecturer spoke to you about Wallasey. Wallasey, as its name indicates, was originally an island, and the Birkenhead docks, before they were enclosed, were one of the mouths of the River Mersey, which I think for a long time silted up to such an extent that it was only a place flooded over at high water spring tide. I imagine that if you took the gates away it would go back to its old condition and become a marsh impassable at spring

* The latest Board of Trade Returns are for year ended December 31st, 1934, and give :—Exports (the produce and manufactures of the United Kingdom)—London £102,171,332, and Liverpool £114,743,872.

Imports—

Liverpool (2nd place), £136,708,107. Hull (next place), £42,236,852.

† The blocks illustrating this article are taken from the *Port of Liverpool* handbook by courtesy of the publishers, Messrs. Littlebury Bros., Ltd.

tide. Wallasey, I imagine, is the Welshman's island, the place to which they were relegated before their civilisation ; but now, of course, they have come back again and are living in Liverpool the same as anybody else !

The ferry-boat service of the River Mersey is very interesting. Sir Percy has told you what the ferry service does. In the whole of my lifetime there has only been one serious accident. On one occasion a ferry boat did run into a sailing ship anchored in the river in a fog, I think in the early '80's. It happened just after that unfortunate accident to the *Princess Alice* in the Thames when so many people were drowned. The passengers on the ferry-boat had probably read about this and how people were drowned in the vortices, and so on, so about twenty of them jumped overboard and swam for it. Unfortunately they were drowned, but the rest were saved, as the damage to the ferry-boat was only slight. When you consider the frequency of the service it is a most marvellous record that they should have carried on all these years without a single serious accident.

Another interesting point is that about the floating cranes. The *Mammoth* was a vessel which had been built for the Russian Government in Holland, but when the War came to an end there was no Russian Admiralty to take possession of it, and the shipbuilders sold it on very reasonable terms to the Docks and Harbour Board. It sometimes does a rather remarkable piece of work. The steel dock gates at the Gladstone Dock weigh about 500 tons each, and if you want to have a gate out for repair you bring along the *Mammoth*, which takes about 200 tons off the weight of the gate until the rest floats. The gate can then be carried floating in the water, put in a graving dock, and repaired. By making use of the water in this way you can lift a load a good deal heavier than the actual lifting power of the crane.

With regard to the echo-sounding apparatus. Its usefulness was shown by the discovery of a wrecked barge, which we knew had sunk, had capsized in sinking and was bottom uppermost. When they tried to locate the wreck by the usual method of sweeping the channel with chains the wreck did not show up, but when they tried echo-sounding they found it almost at once. I do not think the wreck stood more than six or eight feet up from the bottom of the sea, while the depth of the water at this point is about 60–70 feet, which illustrates the efficiency and advantages of the system.

The Tidal Institute is a very successful body, and it gives me a certain amount of satisfaction to think that there are a few quite respectable Englishmen earning their living by telling the inhabitants of Queensland and other places exactly what is going to happen in their own country several years hence, and exactly when it is going to happen.

Mr. Robert Rankin, M.P., said :—I am one of the Members for the City and Port of Liverpool, and I have a hereditary interest in both because my great-uncle was Chairman of the Mersey Docks and Harbour Board, my uncle was a member of the Board, my father was a member of the Board, and his partner (and my partner) was also a member. I have, therefore, as you may imagine, enjoyed extraordinarily the lecture by Sir Percy Douglas.

There was a certain amount in regard to the docks, of course, that I knew before, but he told us much on the technical side that was very new and very interesting. I did not know, for instance, that the Bar Lightship was the most powerful light in the world. It is also interesting to remember that years ago it was Mr. Lloyd George who modelled the present Port of London Authority almost exactly on the lines of the Mersey Docks and Harbour Board. In 1906–7, when Mr. Lloyd George was President of the Board of Trade and his Parliamentary Secretary was Mr. Hudson Kearley, who afterwards, as Lord Devonport, became Chairman of the Port of London

Authority, he created that body by legislation, and it is interesting to look back upon the fact that he modelled its constitution very much on the pattern of the Mersey Docks and Harbour Board. He got hold of the various Thames dock systems and made them into the one great authority with different committees, such as Docks and Quays, Works, Finance, Marine, etc., and there you have the Port of London Authority as it is to-day.

It is a great system that has been described to us to-night, and it is rather sad to think that in the last few years it should in some ways have been short of cargo. However, Liverpool is now more than holding its own. Every year the Mersey Docks and Harbour Board are good enough to send me their financial accounts, and I am very interested to see how their figures are slightly improving every year, and that they are regaining the great volume of business which has always characterised the River Mersey.

MAJOR FRANK BUSTARD, O.B.E., said :—I have been deeply interested, as we all have, to hear Sir Percy's address on the Port of Liverpool, and I think we can all be well satisfied that every facility possible exists at Liverpool for dealing with the vast overseas trade that that port is called upon to handle. A great deal has been said with regard to cargo movements, and the pictures of the cranes, etc., which we have seen demonstrate the facilities available. Liverpool has during recent years gone through a period of great depression, but the cargoes are gradually returning with the improvement in overseas trade. However, at the present day overseas cargo trades are governed largely by tariffs and other circumstances over which the ports have no control, but I think it may be assumed that as cargoes move in greater volume Liverpool will unquestionably hold its own, owing to the facilities under the administration of the Mersey Docks and Harbour Board, and also to the convenience of Liverpool to the great industrial centres and the excellent means of communication which exist between Liverpool and those centres served by the L.M.S. Railway and the several waterways, including the Manchester Ship Canal.

I should, however, like to stress another, and to my mind a greater trade to which Liverpool can look, and which in the national interests I think should be studied, and certainly should claim the attention of a meeting such as this—and that is the great passenger trade of Liverpool. I think Liverpool owes its position largely to the passenger trade which it has handled for so many years past. One of the earliest evidences of a passenger movement through Liverpool was the establishment of the West African slave trade, and whilst that trade is dead and gone, there are still relics in Liverpool showing where the slaves used to be kept and shipped in the sailing vessels. After the slave trade came the great emigrant movements to North America, Canada, Australia, South Africa, etc., which were mainly directed through Liverpool and contributed very largely to the development of Liverpool as a port. As you all know, the emigration trade has practically ceased. It may not come again —if it does come it will come in another form—but we now have other overseas passenger trades, and I feel that one can rightly associate the future of Liverpool with this traffic. There has been rather a tendency of recent years for the overseas passenger movement to move south. We have seen enormous developments at Southampton, and also at London, and there has been a steady diminution in the movement through Liverpool. Unless there can be a swing of the pendulum I feel that Liverpool will not be able to maintain the position it should hold, and the position to which it is geographically entitled. As a national question more attention should be paid to the preservation and development of our ports round the coast, so as to obviate the undue diversion of traffic to the southern ports which neglects the ports serving directly the Midlands and the North and reduces them to what

Liverpool nearly became, almost a distressed area. I see a great future for Liverpool, but we do require to look for a more equable distribution of the overseas passenger trade, and I know of no port better qualified than Liverpool to handle that increasing trade. It is upon increased communication with overseas countries that the future of this country's foreign trade must largely depend.

MR. P. MAURICE HILL (Chamber of Shipping), said :—I should like to draw the attention of the meeting to two or three facts which I think have not been touched upon, and which I think reflect very great credit on the Port of Liverpool. Some years ago a committee was appointed to consider the improvements which might be made in port facilities throughout the country, and it is a remarkable thing that when the visiting committee came to Liverpool there was relatively little which they could suggest in the way of improvements, because Sir Richard Holt and his colleagues on the Board had provided practically everything required by the deep sea ships and the coasting ships.

Another point is that Liverpool is the cleanest port in the country from the medical point of view. I understand it is the most rat-proof port in the country, and the sheds and warehouses, etc., are acknowledged by the port sanitary authorities as a model for the country.

There is a third point which appeals very much to shipowners, and that is that Liverpool lights its own approaches so that the upkeep of lighthouses in the Mersey does not fall upon the General Lighthouse Fund.

DR. W. RUSHTON PARKER said :—This evening's lecture has greatly interested me because my mother's family of Rushton had long resided in Liverpool, and because my father settled there in practice, building a house and becoming surgeon to the Liverpool police, to Walton jail, and to the Kirkdale Industrial Schools, and because I was born in that house over eighty-two years ago. I remember my first school in Bootle at the age of seven, and bathing from the Bootle shore, where now large docks have existed for over half a century ; also my later school at Rock Ferry, and often seeing the *Great Eastern* giant steamship lying there apparently derelict, and witnessing Liverpool's festivities on the occasion of the marriage of the Prince of Wales to Alexandra of Denmark in March, 1863. After that I was away at Epsom, Cambridge, and London for fifteen years, but at Cambridge I had the misfortune to be one of twenty at my college attacked by typhoid fever, three of whom died, while I just managed to reach home before becoming delirious for a fortnight and very nearly dying ; and in my delirium I imagined I had made a fortune in rubber in Sumatra (which a fellow student had previously told me his family had done), and out of this fortune I offered £25,000 to found an art gallery in Liverpool (doubtless overhearing in my delirium that Sir Andrew Walker had just offered that sum for that express purpose, though the Walker Art Gallery eventually cost him £40,000).

After taking my medical degree I lived for two consecutive years in the early 'eighties as House Physician to two Liverpool hospitals, during which time I wrote to the papers suggesting the abolition of the old George's dock near the landing stage, and the erection of the proposed Anglican cathedral on the site ; and though the dock was subsequently abolished, a better site was chosen for the cathedral. Being in indifferent health, I took service as doctor on various steamships to New York, Montreal and Australia, and then on two sailing ships in charge of emigrants to New Zealand, where I also spent many months on horseback in the service of the Government Insurance Company, and so lost the chance of applying for the post of Medical Officer of Health, which was given to my friend, Dr. E. W. Hope. Just

then there was quite a stir in Liverpool about a new method of refining and crystallising sugar by electricity, and there was talk of taking over a whole dock for the anticipated great trade ; I invested all I possessed in this venture, which turned out to be an American swindle, from which I was nearly escaping by the thought that surely the Americans would keep these shares in their own hands if the prospects were so fine.

While two of my brothers settled in Liverpool, one as professor of surgery in the Liverpool University, and the other as professor of Chinese in the Manchester University, I settled in the Lake District for over thirty years, but often visited the Liverpool Museum and Art Gallery, and once in 1888 crossed over to Eastham to watch the beginnings of the Manchester Ship Canal. As I got into a horrible mess in the clay diggings I wrote to the Liverpool Press suggesting that there was a great opportunity for shoeblacks. Happening to visit the same spot a few days later I found scores of them plying their trade, and one of them explained that some " cove " had written to the papers a letter headed " A fortune for shoeblacks," and I was amused to think that I was the " cove " in question.

I trust my great interest in this evening's lecture will be some excuse for these personal details.

Mr. Harold W. Sanderson said :—It falls to my lot, and a very pleasant lot, to ask you to join with me in a vote of thanks to our lecturer and, I should like to add, to our Chairman to-night. It is one of the misfortunes of life that people who live in Liverpool have not quite as much shipping or as much sunshine as we have in the South, and we condole with them on that account. The lecturer, however, has given us a feeling that we should like to live in Liverpool, so attractively has he described its great shipping industry and the benefits of its well-tried organisation affecting the safety and comfort of the whole community.

The Chairman, in acknowledging the vote of thanks, said :—I should like to dissipate the idea that Liverpool is in a sort of down-and-out condition. I was recently asked to go on a deputation to say that we were a kind of distressed area. My answer was that we had the fourth highest figures in the history of the Port. It is certainly not a very strong position to appear before the Exchequer as a claimant to public bounty when your position is the fourth best in your history. But that is not good enough ; we want to do a little better than that.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

Tuesday, June 23..Anthropological Institute, Royal, 52 Upper Bedford Place, W.C. 8.30 p.m. Prof. R. R. Gates, "**Human Heredity Bureau.**"

Queckett Microscopical Club, at 11 Chandos Street, W. 7.30 p.m. Rev. P. de Ternant, "**Off-Shore Trawling for Microscopical Material.**"

Wednesday, June 24..Psychological Society, British, 11 Chandos Street, W. 8.30 p.m. Dr. R. Hill, "**Somnifaine Narcosis.**"

Thursday, June 25..University of London, at University College, Gower Street, W.C. 5.30 p.m. Prof. C. Pellizzi, "**Edmund G. Gardner.**" (In Italian.)

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

MEETINGS OF THE SOCIETY

NEXT WEEK

FRIDAY, JULY 10TH, at 4.30 p.m. (Indian Section). THE RULER OF AUNDH, "Indian Painting" (illustrated by lantern slides in colour). SIR EDWARD A. GAIT, K.C.S.I., C.I.E., a Vice-President of the Society, will preside.

Tea will be served in the library from 4 p.m.

PROCEEDINGS OF THE SOCIETY

ANNUAL GENERAL MEETING

The One-Hundred and Eighty-second Annual General Meeting, for the purpose of receiving the Council's Report and the Financial Statement for 1935, and for the election of Officers, was held, in accordance with the Bye-Laws, on Wednesday, June 24th, at 4 p.m. COLONEL SIR HENRY MCMAHON, G.C.M.G., G.C.V.O., K.C.I.E., C.I.E., Chairman of the Council, was in the Chair.

THE SECRETARY read the notice convening the meeting and the Minutes of the last Annual General Meeting held on June 26th, 1935.

THE SECRETARY then read the following :—

REPORT OF COUNCIL

I.—DEATH OF KING GEORGE V

The Fellows of the Society, in common with all His late Majesty's subjects, felt a sense of personal sorrow at the death of King George V, and also, as members of a corporate body, mourned the loss of a wise and generous Patron.

The late King's association with the Society began in 1894, when, as Duke of York, he was nominated a Vice-President by H.R.H. the Prince of Wales, then President of the Society. The accession of King Edward VII to the Throne in 1901 involved the termination of his tenure of the Presidency and it was the Society's desire that he should be succeeded in the office by H.R.H. the Duke of York. His Royal Highness was at the time absent from the country on a tour round the world, but upon his return intimated his willingness to accept the Presidency, to which, as Prince of Wales, he was elected in December, 1901. For nine years he continued to hold the office, and on his accession to the Throne in 1910 graciously consented to become the Society's Patron.

In 1913 the Albert Medal was awarded to King George, the resolution passed by the Council being in the following terms :—

> "On the occasion of the fiftieth award of the Albert Medal of the Royal Society of Arts, the Council of the Society desire to offer the Medal to H.M. King George V, for nine years President and now Patron of the Society, in respectful recognition of His Majesty's untiring efforts to make himself personally acquainted with the social and economic conditions of the various parts of his Dominions, and to promote the progress of Arts, Manufactures and Commerce in the United Kingdom and throughout the British Empire."

The Council of the Society attended at Buckingham Palace on July 18th, 1913, when H.R.H. the Duke of Connaught, President of the Society, presented the Medal to His Majesty.

The Addresses which were presented by the Society to His Majesty King Edward VIII and to Her Majesty Queen Mary on the occasion of the death of King George V were reproduced in the *Journal* for March 20th.

II.—PATRONAGE OF THE SOCIETY

The Council have much pleasure in being able to record that His Majesty King Edward VIII has been graciously pleased to become Patron of the Society, in succession to His Majesty King George V, who, as above stated, was Patron from the time of his accession until his lamented death.

III.—ORDINARY MEETINGS

INTERNATIONAL BOUNDARIES.—*Colonel Sir Henry McMahon.*

For his Inaugural Address as Chairman of Council, COLONEL SIR HENRY McMAHON chose the subject of "International Boundaries." After referring to the length of the exterior land frontiers of the British Empire—measuring over 31,200 miles—he explained the distinction between the terms "delimitation" and "demarcation." These terms, to which he had himself given their first technical definition, denote respectively the determination of a boundary by treaty or otherwise, together with its definition in written terms, and the actual definition of a boundary on the ground by pillars or other physical means. Sir Henry then

gave an account of the work of four important boundary Commissions in which he had been personally engaged, *viz.*, the delimitation in 1891 of the boundary between Baluchistan on the one hand and the Punjab and Sind on the other, and its demarcation over a length of 300 miles; the demarcation in 1894 of the western portion—a stretch of over 800 miles—of the Durand boundary between India and Afghanistan, a task which occupied two and a half years; the delimitation and demarcation in 1902 of the boundaries between Persia and Afghanistan in Seistan, lasting a further two and a half years, and finally in 1913 the delimitation of the boundaries between Thibet and China, and Thibet and India. In the course of his Address Sir Henry referred to a number of interesting, though not always very pleasant, personal experiences which he had had during his many years of boundary work, involving the delimitation of 3,200 miles and the actual demarcation of 1,300 miles of international boundary.

THE MANUFACTURE OF HUMUS BY THE INDORE PROCESS.—*Sir Albert Howard.*

SIR ALBERT HOWARD, in a paper read before the Society two years ago, dealt with the conversion into humus of the waste products of Indian agriculture by means of a process which had been worked out at the Institute of Plant Industry, Indore. During the present session he contributed a further paper on the subject, entitled "The Manufacture of Humus by the Indore Process." In this paper the lecturer gave an account of the practical results which have been obtained by the application of the process to plantation industries such as coffee and tea, as well as from its adoption by the native cultivators of India and other tropical countries. He then proceeded to describe the application of the method to the treatment of municipal wastes, which has been tried successfully both in India and Kenya. Sir Albert also indicated the directions in which the method may be usefully applied to British agriculture, and concluded with a brief explanation of the place of the Indore process in the theory and practice of agriculture, and its bearing on agricultural research generally.

ART TRAINING FOR INDUSTRY ON THE CONTINENT.—*Mr. Francis A. Taylor*

As the winner of the first prize in the Society's competition for the best essay by an art master on "Training Art Students for Industry and Commerce," MR. FRANCIS A. TAYLOR was enabled to make a month's tour of some of the principal continental art schools, and afterwards read a paper on "Art Training for Industry on the Continent." In the course of his tour Mr. Taylor visited Belgium, Germany, Czechoslovakia, Austria, Switzerland and France, and gave an account in his paper of his impressions of some of their principal art schools. In the majority of these the arrangements made for art education for industry appear to be based on a well thought out collaboration between art schools and industrialists, and include, in France, Germany and Czechoslovakia, a system of compulsory part-time education for apprentices engaged in the artistic trades.

In concluding his survey the lecturer expressed the hope that, whereas in continental countries the various parts of the educational and industrial machine are knit together by legislation in order to ensure that as far as possible art students are absorbed into industry after completing their education, we may secure equally beneficial results in this country by goodwill and determination, and so bring about a real improvement in those industries in which excellence of design is a decisive factor.

MODERN METHODS OF VEGETABLE PRODUCTION AND MARKETING.—*Mr. F. A. Secrett.*

The restrictions which in recent years have been imposed by foreign tariffs, quotas and similar means on the maintenance of our export trade at its former level, and, still more recently, the state of tension in international relations, have brought us to realise more acutely the desirability of increasing our home-grown supplies of food. In a paper entitled "Modern Methods of Vegetable Production and Marketing," MR. F. A. SECRETT described the essential factors for the production of good vegetables. These comprise a good well-drained soil, a plentiful supply of humus, combined with ample cultivation, an efficient irrigation system, soil heating, the use of greenhouses and artificial light for the production of out-of-season crops, and an adequate supply of labour. The lecturer dealt in some detail with all these aspects of vegetable production in the light of the most modern practice, and concluded with a number of suggestions for improving the organisation of marketing together with some criticism of the recently adopted policy of establishing Marketing Boards.

TRAVEL IN THE STRATOSPHERE.—*Professor G. T. R. Hill.*

The successful ascents into the stratosphere by Professor Picard and others and the knowledge of atmospheric conditions in that region gained from such ascents, as well as from sending up small experimental balloons equipped with recording instruments, have drawn attention to the possible advantages of utilising the stratosphere for the air travel of the future. In a paper entitled "Travel in the Stratosphere," PROFESSOR G. T. R. HILL provided a general review of the subject in the light of present-day knowledge. It appears that the temperature of the atmosphere drops more or less uniformly with increased height until at about 35,000 feet it has fallen to —55° C., or 100° F. of frost, but that after that there is no further fall even at much greater heights. Far up into the stratosphere the temperature actually rises until at 160,000 feet, *i.e.*, some thirty miles up, it is believed to be as warm as on the ground, while at two hundred miles up the temperature rises so much that a piece of steel would become red-hot and brass would melt. Such variations in the temperature as well as in the composition of the atmosphere at conceivable flying levels naturally affect both man and engine and, after indicating the directions in which a solution of these human and engineering

problems—many of them sufficiently formidable—may be sought, the lecturer, in conclusion, referred to various factors to be taken into account in any estimate of possible speeds which may be attained in stratosphere flying.

THE ORGANISATION OF TRANSPORT, WITH SPECIAL REFERENCE TO THE LONDON PASSENGER TRANSPORT BOARD.—*Mr. Frank Pick.*

In a paper on "The Organisation of Transport, with special reference to the London Passenger Transport Board," MR. FRANK PICK began by defining organisation as "building up a structure which will discharge its function without avoidable waste or friction . . . A means of so counteracting the unavoidable decay which besets all things that that decay is slower in its onset and less productive of ill consequences." This philosophic note runs throughout the paper, in which the lecturer, while not neglecting to give a clear historical picture of the development of the Metropolitan Transport system, represented its unification as being fundamentally a means for enabling the metropolis to integrate its life—to achieve and realise its unity—in a spiritual as well as a material sense. In this way the lecturer related the unification of transport to the unification of other aspects of municipal and social organisation, to which the former may serve in some respects as a pattern, and, in concluding his paper, emphasised that "underneath the commercial activities of the Board, underneath all its engineering and operation, there is the revelation and realisation of something which is in the nature of a work of art . . . a conception of a metropolis as a centre of life, of civilisation, more intense, more eager, more vitalising than has ever so far obtained."

POST-WAR TENDENCIES IN GERMAN ART SCHOOLS.—*Dr. Nikolaus Pevsner.*

In the field of industrial art we have for some years past felt our deficiencies more and more acutely and have grown to take it as almost axiomatic that an article designed in England cannot be as good as one of continental origin. In a paper on "Post-War Tendencies in German Art Schools" DR. NIKOLAUS PEVSNER has helped us to overcome this inferiority complex by emphasising the fact that the Continent owes the renaissance of its industrial art to English pioneers and influences, and that without such men as William Morris and the school of architects who followed Philip Webb and Norman Shaw, that is without such men as Voysey, Lethaby, Baillie Scott and others, no modern movement would have started on the Continent. The remarkable vitality and *élan* of German industrial art since the revolution of 1918—with its emphasis on the essential unity of all art, including fine art and industrial art—was represented by the lecturer as part of a general regeneration which has also expressed itself in the growth of the youth movement. There is no doubt that the German art schools have been more progressive in recent years than the English schools in acknowledging the vital importance of mass-production for modern industrial art, and possess a far superior equipment. There is much that we can learn from them, but, as the lecturer

rightly concludes, England, the land of William Morris, will find along English lines a solution of her own problem, different no doubt from the German solution, but constructive and representative of our age.

FOOD AND THE WORLD.—*Dr. L. A. Lampitt.*

Several papers and lectures during the present session have been devoted to questions of food and nutrition. In a paper entitled "Food and the World," DR. L. A. LAMPITT, dealing with food from the scientific aspect, first referred to the various agencies—national, academic, and commercial—which are to-day carrying out scientific investigations of food problems. In this connexion he emphasised the importance of encouraging a spirit of collaboration, not only nationally but internationally, since under present conditions, partly owing to the secretive policy favoured in certain countries, a large amount of overlapping still exists. In this country the Food Investigation Board of the Department of Scientific and Industrial Research, together with the Agricultural Research Council, do in fact exercise a certain control which tends towards national collaboration, but the lecturer would welcome a further unification of effort, without restricting too much the individual freedom of scientific workers. He believes that only good could result from greater freedom of discussion of the principles underlying the preparation of food, though he recognises that the application of such principles to particular processes may be legitimately regarded as coming within the province of "trade secrets." The lecturer then gave an account of the various ways in which scientific knowledge is being brought to bear on the production and preservation of food, on improving its quality, and finally on the study of vitamins and other elements, which, though occurring in very minute quantities, are extremely important for nutrition.

CHINESE ART AS AN EXPRESSION OF CHINESE LIFE.—*Mr. Basil Gray.*

In view of the fact that the Exhibition of Chinese Art was being held at Burlington House during the session it was thought desirable to include a paper on Chinese art in the Society's programme. The author, MR. BASIL GRAY, very appropriately decided to approach the subject—the more particular aspects of which were being dealt with in lectures arranged by the Royal Academy—from a general and interpretative standpoint, and in a paper entitled "Chinese Art as an Expression of Chinese Life," explained to his audience the nature of those basic ideas which give Chinese art its peculiarly intellectual and philosophical character. All the Chinese philosophies of life, Taoism, Buddhism, and Confucianism, have one common element—man is never placed in the centre of the universe. There is, in fact, in the Chinese no desire to assert man's right against Nature but rather to reconcile himself with her, and to reflect in his own work something of the rhythm of life to be seen in the natural world. Such an attitude is hard for Europeans to understand, with our deeply ingrained humanism, but it provides the key to the understanding of Chinese art at all periods.

MODERN ARCHITECTURE—FASHIONS AND TENDENCIES.—*Mr. Oswald P. Milne.*

A paper on "Modern Architecture—Fashions and Tendencies" by MR. OSWALD P. MILNE began with a query: Are we evolving a new architecture or just drifting among fashions and stunts with a desire to be different at all costs from former generations? The great styles of the past, the lecturer pointed out, were really a gradual evolution one from the other, changing slowly in a slowly changing world. The discovery of steam-power, which started the industrial revolution about 175 years ago, and the growing avalanche of new mechanical inventions and new materials, have incredibly quickened the tempo of life, and man has been unequal to the task of suddenly inventing a new style of building at once to utilise and to express the new mechanical powers which he has won. Is our architecture, the lecturer asked, emerging from the slough of Gothic and Tudor revival and finding a form truly expressive of our machine age? While he was severe on such affectations as "the window that bites the corner out of a building" and the line of solid balconies often too narrow for use and taking sun from the windows below, he expressed himself as being whole-heartedly in sympathy with the spirit and idea which informs the best of modern architecture, while maintaining that it is indispensable for English architects to be steeped in English traditions of building, and that only by knowing how skilled the old builders were in their craft can they carry the art of architecture forward.

POTTERY IN ENGLAND'S INDUSTRIAL HISTORY.—*Dr. John Thomas*

The period about 1760 seems to be generally accepted as the starting point of the Industrial Revolution in England, but historians of the pottery industry have shown a disposition to post-date its commencement in relation to this particular industry to 1830 or even 1870.

In a paper entitled "Pottery in England's Industrial History" DR. JOHN THOMAS successfully established the fact that the industrial revolution—though he reminds us that in the case of the pottery industry at any rate it was an evolutionary process—had begun as far back as the 1780's. This development is associated with the name of the great Josiah Wedgwood, and we find Josiah Spode and Josiah Wedgwood vying with each other in the matter of the horse-power of the steam engines which they commissioned at this time from Messrs. Boulton & Watt. We hear too of Josiah Wedgwood financing Matthew Boulton to the extent of £5,000 during the experimental stages of the manufacture of Watt's steam engine, helping in the promotion of the Grand Trunk Canal which has served the Staffordshire potteries from 1777 until to-day, and in a variety of ways interesting himself in the application of science to industry. In the course of his paper Dr. Thomas drew attention to the association at this period of Josiah Wedgwood with the Royal Society of Arts. He perpetuated the memory of many distinguished members of the Society, including Benjamin Franklin, David Garrick, Oliver Goldsmith, Samuel Johnson, Sir Joshua Reynolds, and the Society's Secretary,

Samuel More, by cameos, medallions and busts, a selection of which were displayed at the lecture, and also gave employment to many young artists, modellers, and sculptors who had been discovered and encouraged by premiums offered by the Society.

THE RACIAL ELEMENTS OF SUMERIAN ART HISTORY.—*Sir Leonard Woolley.*

Two sessions ago SIR LEONARD WOOLLEY read a paper on "Excavations at Ur," and followed this up during the present session by a paper on "The Racial Elements of Sumerian Art History." The fact that the Sumerians were a hybrid people, as the lecturer adduced considerable evidence to prove, accounts, in his view, for their ability to produce such remarkable works of art at so early a period of history. The pottery vases found in the pre-Flood strata are really beautiful productions, finely fashioned, well-baked and decorated with painted patterns, and their very marked resemblance to pottery of the same period found in Persia and Baluchistan, and still further to the east and north, justify the conclusion that at this very early period there existed a more or less uniform culture extending from Mesopotamia to the borders of Manchuria and China.

As a result of the Flood, a progressive degeneration in the art of pottery appears to have ensued, until the remnants of the pre-Flood inhabitants were revitalised by the influx of two separate streams of invaders travelling down the Euphrates and Tigris valleys, from northern Syria and Anatolia. In the lecturer's opinion, the artistic excellence of later Sumerian art—not only in pottery but in metalwork and stone—is the result of the blending of these three different races.

CAN AGRICULTURE PROVIDE SUBSTANTIAL RELIEF FOR UNEMPLOYMENT ?—*Sir Daniel Hall.*

A topic which has recently occupied a good deal of public attention was discussed by SIR DANIEL HALL in a paper entitled "Can Agriculture Provide Substantial Relief for Unemployment ?" Between 1871 and 1931 the number of farmers and their relatives on the land has remained approximately the same, but there has been a reduction of 40 per cent. in the number of employees, the result of the introduction of machinery into farming operations and a continuous change-over from arable to grass. The fact that the number of small holdings shows a continuous decrease in spite of the deliberate efforts to increase them is sufficient evidence, in the lecturer's opinion, that they no longer represent a form of occupation that will attract and retain men on the land. The lecturer, indeed, suggested, but only as a subsidiary measure, that an outlet for men who have not been bred upon the land might be found by way of the specialisation of the smallholder upon a single branch of farming, *e.g.*, pig-keeping. Such an enterprise could be organised by a central bacon factory which would buy the feeding stuffs in bulk, distribute them to the smallholders, collect the pigs when ready, and pay for them at a rate based upon the cost of feeding stuffs. But, in Sir Daniel's view, such measures, though useful, cannot take us very far and he

would like to see "big business" attracted to farming, with its ability to take the long view, its command of capital, and its power of direction and organisation. This he believes to be the true line of advance to greater production and employment.

ELECTRICALLY PRODUCED MUSIC.—*Mr. G. G. Blake.*

Demonstrations of electrical music have on several occasions been given in London—the first by Theremin, who, in 1927, at the Albert Hall gave a recital of "Music from the Air" on his "Etherophone." The first explanation of the underlying principles of the apparatus by means of which such musical effects are produced was provided by MR. G. G. BLAKE in a paper entitled "Electrically produced Music." It appears that all the various instruments which have been devised for producing what is called electrical music operate on the same general principle, and that when the performer on such an instrument brings his hands nearer to, or withdraws them from it, he varies the capacity of the electrical circuit, and that this brings about a change in the electrical resonance upon which the pitch and character of the musical response depend.

THE ACOUSTICS OF HALLS.—*Dr. G. W. C. Kaye.*

The view that good auditorium acoustics are a pure gamble, and if not an Act of God, certainly a gift of the gods, was long cherished. In recent years, mainly owing to the pioneer researches of W. C. Sabine and the American school of workers, together with those of Hope Bagenal and others in this country and Germany, architectural acoustics has become a science of which most of the physical principles are simple and well-established and the practical outcomes are mainly predictable. In a lecture delivered under the Aldred Trust, entitled "The Acoustics of Halls," DR. G. W. C. KAYE gave an account of some of the main factors making for good acoustics and of the scientific methods which to-day make it possible for the acoustical properties of any proposed shape and size of auditorium to be calculated with a good deal of exactitude. The concluding paragraphs of the lecture were devoted to a consideration of the acoustical properties of the Society's lecture hall, which Dr. Kaye pronounced to be good.

ONE ASPECT OF ENGLISH MUSIC.—*Sir Walford Davies.*

In the past the Society has devoted considerable efforts and expenditure to the encouragement of music, having taken a leading part in the establishment in 1876 of a National Training School for Music, later reconstituted as the Royal College of Music, and also having held examinations in music from 1859 to 1914. It was therefore appropriate enough that the annual *Trueman Wood Memorial Lecture* should be delivered by SIR WALFORD DAVIES on "One Aspect of English Music." The aspect chosen by the lecturer was English Melody, which he suggested to be "a department, so to speak, of English good manners." While

emphasising that everything vital to a melody's very existence is super-national, he drew attention to those characteristics which make a melody peculiarly English. One of these is the prevailing English predilection for the common major scale, which, he said, is preponderantly present as an unconscious controlling factor in us all; another characteristic is the prevalence of the monosyllabic habit in our melody, from such early fragments as "Sumer is i-cumen in" down to Elgar's *Land of Hope and Glory*, and a third notable attribute of English melody is its directness—a tendency to exclude or curtail grace-notes, turns and chromaticisms. In conclusion, the lecturer showed how these peculiarly English qualities are paralleled in English poetry, quoting Milton :—

> "They hand in hand with wandering steps and slow
> Through Eden took their solitary way";

and Shakespeare :—

> "A lover's eyes will gaze an Eagle blind.
> A lover's ear will hear the lowest sound."

FORESTRY IN THE EMPIRE.—*Sir Roy Robinson.*

The subject of "Forestry in the Empire," on which a paper was read by SIR ROY ROBINSON, has received considerable attention since the War. There have been four Empire Forestry Conferences and a determined attempt has been made to lay down, for the guidance of Governments, the essential ingredients of a sound forestry policy. That the problem is a difficult one will be understood when it is stated that the total area of forest in the British Empire is 2,500,000 square miles—nearly one-fourth of its land area—and that there are some fifty separate forest services, with not more than 1,500 forest officers qualified for supervisory and administrative duties. With a view to providing facilities for a higher standard of technical training for the superior grades of the Forest Services an Imperial Forestry Institute was founded in Great Britain after the second Forestry Conference of 1923, but this—largely for financial reasons—has not so far received general support from the Dominions. After referring to these and other administrative problems, the lecturer proceeded to give an account of the forestry position in relation to each of the principal forest-owning countries of the Empire, and, in conclusion, emphasised the paramount importance, from climatic, industrial and also more general points of view, of conserving the Empire's forest resources.

THE FITMENT AND DECORATION OF SHIPS, FROM THE *Great Eastern* TO THE *Queen Mary*.—*Mr. John de La Valette.*

In a paper entitled "The Fitment and Decoration of Ships, from the *Great Eastern* to the *Queen Mary*," MR. JOHN DE LA VALETTE gave a survey of the succeeding styles and ideas for the interior decoration of ships which have found favour at various periods since the introduction of the passenger steamship. In

the course of his review the lecturer described the styles of decoration adopted in a number of particular ships, both British and foreign, and in this connection deprecated the tendency, which has frequently been evident in great passenger liners, to obscure the structural lines of the ship with the object of making the passengers forget that they are at sea. The concluding portion of the paper was devoted to a description of some of the more salient features in the design and decoration of the *Normandie* and the *Queen Mary*, which provide an interesting comparison of French and British ideas of shipbuilding and ship decoration.

THE PORT OF LIVERPOOL.—*Vice-Admiral Sir Percy Douglas.*

In a paper on "The Port of Liverpool" VICE-ADMIRAL SIR PERCY DOUGLAS, after giving a brief account of its early history, described in some detail the system of docks, warehouses, floating stages, dredgers, surveying and salvage vessels, lightships, pilot boats, etc., which are controlled by the Mersey Docks and Harbour Board. The history of the Port may be said to begin in the year 1207 when King John granted a charter to the Borough of Liverpool; in the reign of Charles II Liverpool became a free and independent port, having previously been subject to the much older port of Chester, and in 1715, during the reign of Queen Anne, opened for trade the first enclosed commercial dock ever built. Since that date dock after dock has been built so that to-day the port has probably the finest closed dock system in the world, and is the first export port and the second import port of Great Britain.

THE PROBLEM OF WHEAT SUPPLY IN TIME OF WAR.—*Sir Herbert Matthews.*

Many people can remember how serious the problem of food supplies became during the last war, but the responsible authorities seemed to have forgotten the lessons then learned until the other day when the new Defence Minister, in reply to a question in the House of Commons, stated that "a special committee is now engaged in a re-examination of the whole question of food supply in an emergency." In a paper dealing with one aspect of this question, *viz.*, "The Problem of Wheat Supply in Time of War," SIR HERBERT MATTHEWS, after referring to the Minority Report of the Royal Commission appointed in 1903 to consider the Supply of Food and Raw Material in Time of War, asked whether we were going to allow ourselves to be caught in a similar state of unpreparedness in the event of another war, the conditions of which, with regard to food supply, might be much more unfavourable. His watchword, like Professor Stapledon's, was "Keep the plough going," and he urged that we should always have twelve months' supply of wheat in hand, of which half would be kept in the stack and half in silos or elevators. The storing of wheat and the giving of a bonus would, he admitted, mean expenditure—perhaps as much as the cost of a battleship or even two—but it would release many warships from the burden of trying to defend the sea routes and leave the Navy free to carry out its proper work.

THE OIL ENGINE AND ITS INFLUENCE ON ROAD, RAIL AND AIR TRANSPORT.—*Mr. Mackenzie Junner.*

In a paper entitled "The Oil Engine and its Influence on Road, Rail and Air Transport" MR. MACKENZIE JUNNER provided a review, from a general rather than a technical standpoint, of what this form of power unit has done and is likely to accomplish. After a comparison of the oil with the petrol engine, from which it appears that for a variety of purposes the former has distinct advantages, the lecturer described in some detail the remarkable progress which the oil engine has made in recent years, both in this country and abroad, in connexion with road, and to a lesser degree, rail transport, and, in conclusion, dealt at some length with the almost infinite potentialities of the oil engine for aeroplanes.

EARLY COMMERCIAL ADVERTISING IN ENGLAND.—*Mrs. Herbert Richardson.*

Commercial art and advertising occupies an important place in the world of to-day, and in MRS. HERBERT RICHARDSON'S paper on "Early Commercial Advertising in England, from the fifteenth to the nineteenth century" there was much to interest the curious and much too to show that our forbears were not so ignorant of the art of advertising as we are apt to imagine. Caxton, the father of English printing, may also be regarded as the father of English advertising, having issued in 1477 a small advertisement, now in the Bodleian library, of the rules for the commemoration of saints' days according to the use of the Sarum diocese. Nearly 200 years later King Charles II gave royal sanction to advertising by his famous advertisement in the *Mercurius Publicus* on June 28th, 1660, for a missing dog of uncertain breed "between a Greyhound and a Spaniell," doubtless stolen, as the King explains with characteristic irony, "for the Dog was not born nor bred in England, and would never forsake his Master." The lecturer traced the progress of the advertising art through the centuries with many quaint and amusing illustrations into the nineties of last century, and emphasised, in conclusion, that the finest achievements of to-day have been developed out of an age-old national tradition, in which, at its best, are to be found dignity and beauty, wit and humour, and even something of that subtle quality we to-day call "punch."

THE CASE FOR LAND IMPROVEMENT AND RECLAMATION.—*Professor R. G. Stapledon.*

PROFESSOR R. G. STAPLEDON'S recent book, *The Land*, at once impressed our leading agriculturists as a pronouncement of quite outstanding importance. In a paper entitled "The Case for Land Improvement and Reclamation" Professor Stapledon developed more particularly the case for the improvement and reclamation of our grass lands, 16½ million acres of which he stated to be in a more or less neglected condition, much of it being absolutely derelict. His remedy is a gigantic ploughing-up programme, supported by the abundant use of lime, phosphates, and the right sort of grass seeds, *viz.*, wild white clover, perennial rye-grass and cocksfoot. With a view to keeping the land of Britain in a ploughable and "flexible" condition, so

that it can be utilised at short notice for whatever purposes of peace or war the occasion may require, and in order to increase the fertility of the soil, the lecturer strongly advocated a four- to six-year ley system of farming. The arguments he advanced in support of this policy were: (1) the need for maintaining a large and vigorous rural population; (2) the need for producing sufficient fresh food of good quality to ensure the nation's health, and (3) the need for safeguarding our food supply—the most essential munition of war. In conclusion, the lecturer suggested that the prognostications of the economist in a rapidly changing world were necessarily less reliable than those of the thorough-going experimenter and idealist, and expressed his belief that if this country would take heed to its rural resources in men, land, and food, it would be the best thing that could possibly happen for the national welfare.

THE ART OF OUR DAY.—*Mr. Philip de Laszlo.*

In a paper on "The Art of Our Day" MR. PHILIP DE LASZLO reaffirmed the idealistic conception of art which, as we have been taught, inspired the work of the great artists of the past. The seriousness of intention and loftiness of effort which are observable in the Parthenon of Phidias and in the monumental work of Michelangelo in the Sistine Chapel are largely due, the lecturer suggested, to the intimate association of art with religion during many thousands of years. In how many of the artists of to-day, asked the lecturer, can we discern evidences of earnest intention? Does not their work too often show symptoms of that "aggressive barbarism" of which the French critic, Camille Mauclair, roundly complains? Critics and writers on art, too, are guilty of insincerity and affectation, maintaining that a man is only to be counted as an artist when he evolves something out of his inner consciousness without reference to or dependence upon Nature. After throwing down this challenge Mr. de Laszlo ended on a more hopeful note, and confessed that signs of a revival of a truer vision might already be perceived. Students were beginning once more to appreciate the value of thoroughness, and to interest themselves in qualities of draughtsmanship and technical expression, and in these and other ways were providing evidence of the growth of a sounder and healthier spirit.

IV.—INDIAN SECTION

THE QUETTA EARTHQUAKE.—*Sir Henry Karslake.*

Six papers, including the Sir George Birdwood Memorial Lecture, were read at meetings of the Indian Section during the session.

An outstanding event in India during the year 1935 was the calamitous earthquake which occurred in the mountainous region around Quetta, one of the most important military stations in the Empire. Large portions of the city and many villages in the surrounding country were destroyed and thousands of lives were lost. But considering the magnitude of the disaster, the swiftness and comprehensiveness of the rescue work organised by the then Commander of the Baluchistan District, Major-General Karslake (who has since been knighted for his services at

that time) were beyond praise. Within a few minutes of this sudden emergency (which occurred at 3 o'clock in the morning) General Karslake had taken charge of the whole situation (the civil administration having been rendered helpless by the heavy loss of life among its personnel), had made his plans and begun to put them into operation, and this in spite of the complete breakdown of all normal means of lighting and communication. His relief measures included not only the rescue of those who were buried under the debris, and medical aid for the wounded, but temporary provision of all the essentials of life for the uninjured and lightly injured—housing (a new and orderly city of tents was erected before the evening on the racecourse), food, water, sanitation and so on. These operations were described by SIR HENRY KARSLAKE himself in a paper entitled " The Quetta Earthquake," the Chair being taken by the present Chairman of the Society, whose name also has distinguished associations with Quetta.

THE CULTURAL INFLUENCES OF ISLAM IN INDIA.—*Sir Abdul Qadir.*

The Sir George Birdwood Memorial Lecture was this year for the first time delivered by an Indian, SIR ABDUL QADIR, who took as his subject " The Cultural Influences of Islam in India." At a time like the present, when the communal problem is causing so much concern, it is well to remember the surprising extent to which the Hindu and Moslem civilisations have in fact become intermingled in the course of centuries. The most notable example of this unifying process has been the formation of the Urdu language, a mixture of Persian and Hindi, which has now become the most commonly used language in India. And linguistic unity has led to cultural unity. New forms of poetry have been developed in the Urdu language by Moslem and Hindu alike, and literary festivals have been initiated which are attended by large numbers of the adherents of both faiths. Sir Abdul Qadir also referred to the spread of some of the basic religious ideas of the Moslems among the better educated Hindus, and sketched their artistic influence in painting, the illumination of books, calligraphy and music. It is a remarkable fact that the latter art, although, being the most sensitive of all the arts, it is most capable of assuming the characteristic marks of a particular race or nation, yet over-rides most easily all racial boundaries. Thus the Moslems in India, whose religion had at its origin discouraged music, soon acquired a love of it under the influence of the Hindus about them, and it was perhaps in this direction that intercourse between the two communities developed most freely.

THE TEA INDUSTRY IN INDIA —*Mr. E. A. Watson.*

The history of the tea industry in India goes back just over a hundred years. The Royal Society of Arts had given a lead for the introduction of tea planting into the British Empire by its offer in 1822 and succeeding years of a gold medal for the production of tea, first in the West Indies and then in South Africa, Mauritius and New South Wales. The offer produced no immediate response, but in 1834 a committee was appointed by the Governor-General of India to enquire into the

possibilities of raising tea in India. Plantations were established in Assam and samples of the produce were sent to this country in 1838 and presented to the Society, which in 1840 awarded to the Superintendent of the new plantations the medal which it had previously offered in vain. To-day, as MR. E. A. WATSON showed in a paper entitled " The Tea Industry in India," India is a leading exporter of tea, and tea planting forms one of its most important industries. The area under tea approaches a million acres in extent, and the annual output is in the region of 400 millions lbs., while the value of tea exports from India in 1933-34 was over £15,000,000. An industry of such dimensions is, of course, an important employer of labour, and needs far more than can be found locally, the tea gardens mostly being situated in forest districts. The recruitment of labourers in other parts of India, their transport to the plantations and settlement there has in consequence imposed a heavy burden of expense on the industry, but the immigrant workers are to an increasing extent permanently settling in the tea districts with their womenfolk (who can also be employed in the industry) and children. This problem should therefore solve itself in time, and it is important to note that the Whitley Commission in 1931 considered that this migration was in the interests of labour as well as of the industry. During the last few years the industry has been suffering severely from the effects of world over-production, but an international agreement to limit exports of tea appears to be working satisfactorily, while strenuous efforts are being made in this country and in India itself to increase consumption.

THE EDUCATION OF GIRLS IN INDIA.—*Lady Hartog.*

The imminent establishment of the New Constitution makes the improvement of the educational services in India a matter of great moment, and the paper read by LADY HARTOG on " The Education of Girls in India " was therefore highly opportune. Unfortunately the situation, as she described it, is not altogether an encouraging one. An admirable lead has throughout been set in this matter by the missions in India, but the time has now come for expansion far beyond their power and scope, and needing government planning and support. Since the Hartog Report of 1929, which emphasised this need, there has, it is true, been an unprecedented influx of girls into schools and colleges, but there has not been anything approaching a corresponding increase in the provision made for them. Not only buildings but teachers are required, and of trained teachers there is a great dearth. This is partly due to the deterrent effect on the recruitment of teachers of the conditions under which village teachers have to live, and steps are being taken, by the provision of hostels and so on, to remedy this. At the primary stage the difficulties have been partly met by the admission of girls into boys' schools—the pressure of economy has forced co-education on India not as an ideal but as a necessity ; but the unsatisfactory nature of the tuition and of the accommodation must be held at least partly responsible for the wastage of girls from the schools before they have arrived at a stage at which their education can

have any permanent value. Of all the girls at school in India more than half are still in the lowest primary class, and only one-tenth of them reach a stage of real literacy. At the secondary stage, where co-education is not an advisable expedient, a hundred per cent. increase in numbers during the last five years has resulted in overcrowding the existing (mostly excellent) schools. In the universities also, although women have been making splendid advances of late years, they are sadly in need of hostels and separate colleges. Such large increases of expenditure as the present situation requires are not forthcoming as quickly as the leaders of reform would wish, but there is no doubt that the movement now on foot, which is being increasingly supported by the women of India themselves, is one which will not easily be stopped.

THE DEVELOPMENT OF INDIAN PORTS —*Sir Charles Stuart-Williams.*

In 1928 SIR CHARLES STUART-WILLIAMS read a paper on "The Port of Calcutta and its Post-War Development." During the present session he contributed a paper entitled "The Development of Indian Ports," in which he surveyed port conditions throughout the country. Sir Charles described in some detail the seven "major" ports of British India (including Rangoon). It is a remarkable fact that over 91 per cent. of the whole trade of that vast country should pass through these few major ports, a state of things which is due partly to the railway systems which are based upon them and partly, no doubt, to the prestige accruing from their age, nearly all of them having a long history behind them. Indian ports, like those of other countries, are now suffering heavily from the depression, and even now the volume of trade is only half what it was before the slump, but in the view of the lecturer the condition of things is seriously aggravated by the existence of heavy customs duties, which reduce the volume of trade using the ports, without contributing anything to their funds, as the whole of the proceeds are claimed by the Government.

INDIAN EXTERNAL TRADE.—*Dr. D. B. Meek.*

The most remarkable feature in the recent history of Indian External Trade, which was the subject of a paper by DR. D. B. MEEK, has been the sudden rise, owing to the recent financial crisis, of a new export trade in gold, which has offset what would otherwise have been a grave adverse balance of trade since the coming of the same crisis. It is not often, unhappily, that evils bring their own cure in this way. Another trade which has of late years increased enormously is the export of groundnuts, while the production and exports of tea were also steadily growing up to the year 1933, when world over-production caused an artificial limit to be set to this product. Unfortunately, Dr. Meek's careful analysis of the statistics of production and trade seemed to indicate that there is little ground for optimism in other directions. The agricultural position is always of prime importance in India, and his statistics showed that the production of food is not keeping pace with the increase in the population. Other agricultural products,

and an increase in mineral and industrial products, are at present maintaining a general equilibrium, but the lecturer expressed concern for the future, in view of the fundamental economic importance to the country of agriculture and the fear that through lack of land the production will increasingly tend to lag behind the growth in population.

V.—DOMINIONS AND COLONIES SECTION

THE TANA RIVER REGION OF KENYA COLONY.—*Mr. H. C. Sampson.*

Four papers were read at meetings of the Dominions and Colonies Section during the session.

An undeveloped area of East Africa which has for many years periodically aroused the hopes of speculators and governments and unhappily soon disappointed them was the subject of a paper by MR. H. C. SAMPSON, entitled "The Tana River Region of Kenya Colony." Mr. Sampson recently accompanied as agricultural specialist a small expedition sent by the Government of Kenya to investigate the area and report on the prospect of its becoming an asset to the Colony if irrigation can be developed. They found that the lower valley, which is desert land except for a narrow flood valley, was definitely unsuitable for development on account of both the alkaline and clayey nature of its soil and the practical difficulties of irrigation which it presented, but that in the upper valley the soil was more fertile and the lie of the land provided a possible canal scheme. Although a thorough survey would be necessary before arriving at a final decision, the lecturer stated that the best that could be expected is that such development would be justified as a means of support for the scanty population of the district and not as a productive commercial proposition. It is more than likely, however, that if such relief work had to be undertaken, other areas of the Colony might be developed at a smaller cost.

THE MAORI PEOPLE.—*Viscount Bledisloe.*

The safeguarding and amelioration of the rights and conditions of the minorities and native races of the world has become a commonplace in political discussions, yet progress is everywhere fraught with difficulty. In a paper entitled "The Maori People," VISCOUNT BLEDISLOE put forward the view that the condition of the finest native race in the Empire, belonging to one of its most prosperous Dominions, gives grave cause for anxiety. During the century since the signing of the Treaty of Waitangi, whereby the Maoris became British subjects, they have lost—by purchase, it is true, but often by unfair purchase—most of their land and, what is perhaps more serious, much of their racial pride and confidence. Movements of a more or less hostile character resulted at intervals during the nineteenth century, and the present century is witnessing a fresh struggle for existence, but fortunately in a new and happier form. This movement, the leading figure in which is Sir Apirana Ngata, seeks to foster a renaissance of the whole race based on work, and large co-operative farming and land settlement schemes

have already been embarked upon. The lecturer pointed out, however, the danger that this rallying of the Maoris to a call to industry may lead them away from those distinctive ways of life and thought which are of more vital importance to their community even than national prosperity.

MAURITIUS.—*Sir Louis Souchon.*

"Mauritius" was the subject of a paper by SIR LOUIS SOUCHON, in which he recounted the history, topography and industries of this far-away British possession. Beyond its association with the Dodo the average Britisher knows little of this delectable little island in the Indian Ocean, but as portrayed by the lecturer it was shown to be a country charming alike for its scenery and its people, and a veritable paradise, as Darwin called it, but for the unhappy scourge of malaria which has assailed it since 1866. The commercial importance of Mauritius is almost entirely linked with the sugar trade. Sugar forms 97 per cent. of its exports, and this is due to the fact that the sugar cane grows there to perfection and is the only crop which is able to stand up to the violent gales which visit the island. Mauritius has been a British possession since 1810. It was taken from the French at the conclusion of a war characterised by a remarkable courtesy and chivalry about which some charming stories are told. The spirit of the war became the spirit of the peace. The French settlers were allowed to retain their language, religion, laws and ways of life, and have kept them to this day, while they for their part have consistently shown a high loyalty to the British crown.

INSECT PESTS AND EMPIRE PRODUCTS.—*Professor J. W. Munro.*

A paper entitled "Insect Pests and Empire Products" was read by PROFESSOR J. W. MUNRO, who is a leader in the researches now being conducted into this problem. The work which he described is not only saving merchants many thousands of pounds, but incidentally has an important bearing upon the problem of food supplies in time of war. Should stores of foodstuffs be laid down, as has been advocated, the danger of their destruction by insects will be fully as great as the danger of their destruction by the enemy. A full estimate of the damage which insects are causing to stored products cannot be made, but an idea of its extent can be gathered from the fact that in 1929 and 1930 the losses incurred by the tobacco trade as a result of the infestation of African tobacco was at least £100,000. Professor Munro described the various angles from which the problem is being attacked, but as far as actual practical results are concerned, the most successful means of destroying most types of insects has been the use of fumigants. This method proved highly efficient in dealing with a serious infestation of Australian dried fruits, and gave considerable success in meeting tobacco infestation. Increasingly valuable as the results of these researches are proving, their application, at any rate overseas, is proving difficult through lack of trained men. It is to be hoped that the importance of this work may be more fully recognised and that this deficiency may be met, particularly in view of the bearing of the subject, as already mentioned, upon Imperial defence.

VI.—CANTOR LECTURES

GEOLOGICAL ASPECTS OF UNDERGROUND WATER SUPPLIES.—*Dr. Bernard Smith.*

The first series of Cantor Lectures was delivered by DR. BERNARD SMITH, his subject being "Geological Aspects of Underground Water Supplies." In the first lecture Dr. Smith explained the various means by which rainfall is naturally disposed of, and described the characteristics of rocks in regard to their water-bearing qualities. Finally, he dealt with the possibilities of water-supply from the so-called impervious rocks of the mountainous districts of Britain. In his second lecture he discussed the behaviour of underground waters: their levels and their emergence in springs, bournes and artesian wells; and then described the pervious and partly pervious rock formations as sources of supply. In the final lecture an account was given of various complications which occur in the search for underground water through geological irregularities, and the lecturer concluded by emphasising the importance of a survey of inland waters.

NUTRITION AND NATIONAL HEALTH.—*Major-General Sir Robert McCarrison.*

MAJOR-GENERAL SIR ROBERT MCCARRISON gave a series of lectures on "Nutrition and National Health." After a brief description of the nature of food and of the nutritional process, Sir Robert described the effects of correct and faulty diet as he had observed it among the races of India and in the course of large scale experiments on rats. He then described in detail the relation of certain food essentials—oxygen, water, proteins, mineral salts and vitamins—to the structure and functions of the body. In his concluding lecture he took up the national aspect of the question: after claiming that malnutrition is, with faulty diet, the principal cause of disease, he drew attention to the prevalence of ill-health at the present time, and appealed for a national, and governmental, effort to improve the popular diet.

LETTERING AND ITS USES TO-DAY.—*Mr. Percy Smith.*

The third series of lectures was delivered by MR. PERCY SMITH on "Lettering and its Uses To-day." In the first lecture a survey was given of the history of the subject from the earliest times up to the present day and the development of the roman, gothic and italic alphabets was described. In his second lecture Mr. Smith discussed the quality of individual letters from the point of view of their beauty and their legibility, and explained the use of single decorated letters as initial capitals and in monograms. Mr. Smith concluded the series with a lecture on the practical uses of lettering in personal correspondence, on memorials, in public notices and in association with architecture.

VII.—PETER LE NEVE FOSTER LECTURES

PROBLEMS OF ROAD RESEARCH.—*Dr. Reginald Stradling.*

The Peter Le Neve Foster Lectures were delivered by DR. REGINALD STRADLING, who took as his subject "Problems of Road Research." After

describing methods of research into the qualities of sands and clays as road foundations, the lecturer gave an account of the work which is being carried out upon the substances of the roads themselves. The difficulties of accurately grading and mixing concrete were described and the use of the " vibrator," whereby the water content may be standardised, was explained. In the second lecture the various failures of bituminous roads were analysed and a description was given of the three machines which have been devised by the Road Research Laboratory to test surfacing materials under conditions similar to those on the road but in a much shorter time. In his concluding lecture Dr. Stradling described the methods used to assess the impact forces exerted by traffic of various types upon roads and to obtain a grading of the frictional resistance of road surfaces.

VIII.—DR. MANN JUVENILE LECTURES

ANIMAL INTELLIGENCE.—*Dr. David Katz.*

Under the Dr. Mann Trust, DR. DAVID KATZ delivered two Juvenile Lectures on " Animal Intelligence." After demonstrating the difficulty of correctly interpreting the actions of animals owing to the fundamental difference between their mentality and life and those of man, he discussed the intelligence of animals as shown, first, in instinctive behaviour, second, in learning by experience, and finally—in very few instances, as the lecturer believed—in the use of reasoning power. He concluded by explaining that the fundamental difference between man and animals is the possession of self-consciousness by the former.

IX.—ALBERT MEDAL

The Albert Medal of the Society has been awarded by the Council, with the approval of H.R.H. the Duke of Connaught, to the Earl of Derby, K.G., for " the advancement of Commerce and Arts, especially in Lancashire."

X.—MEDALS FOR PAPERS

Fourteen silver medals have been awarded for papers read before the Society during the current session—eight for papers read at Ordinary Meetings, four for papers read before the Indian Section, and two for papers read before the Dominions and Colonies Section.

The awards are as follows :—

Papers read at Ordinary Meetings :—

F. A. Secrett, F.L.S., " Modern Methods of Vegetable Production and Marketing."

Frank Pick, " The Organisation of Transport, with special reference to the London Passenger Transport Board."

Dr. Nikolaus Pevsner, " Post-war Tendencies in German Art Schools."

Basil Gray, " Chinese Art as an Expression of Chinese Ideas of Life."

John Thomas, M.A., Ph.D., " Pottery in England's Industrial History."

John de La Valette, "The Fitment and Decoration of Ships from the *Great Eastern* to the *Queen Mary*."

Professor R. G. Stapledon, C.B.E., M.A., "The Case for Land Improvement and Reclamation."

Philip A. de Laszlo, M.V.O., "The Art of Our Day."

Papers read before the Indian Section :—

Major-General Sir Henry Karslake, K.C.S.I., C.B., C.M.G., D.S.O., "The Quetta Earthquake."

E. A. Watson, "The Tea Industry in India."

Lady Hartog, "The Education of Girls in India."

D. B. Meek, C.I.E., O.B.E., M.A., D.Sc., "Indian External Trade."

Papers read before the Dominions and Colonies Section :—

Sir Louis Souchon, C.B.E., "Mauritius."

Professor J. W. Munro, M.A., D.Sc., "Insect Damage to Empire Products."

For many years it has been the practice not to award medals to members of the Council or to persons who have already received a medal for a paper read in a previous year. The Council were therefore precluded from considering the following papers :—

Sir Albert Howard, C.I.E., "The Manufacture of Humus by the Indore Process."

Oswald P. Milne, F.R.I.B.A., "Modern Architecture—Fashions and Tendencies."

Sir Daniel Hall, K.C.B., LL.D., F.R.S., "Can Agriculture Provide Substantial Relief for Unemployment."

G. G. Blake, M.I.E.E., F.Inst.P., "Electrically Produced Music."

Mrs. Herbert Richardson, "Early Commercial Advertising in England."

Sir Charles Stuart-Williams, "The Development of Indian Ports."

The Right Hon. Viscount Bledisloe, P.C., G.C.M.G., K.B.E., "The Maori People."

The Council, however, desire to express their high appreciation of these papers.

XI.—THOMAS GRAY MEMORIAL TRUST

Under the Thomas Gray Memorial Trust, the objects of which are "The Advancement of the Science of Navigation and the Scientific and Educational Interests of the British Mercantile Marine," the Council in 1935 offered the following prizes :—

I.—Prize for an Invention

A prize of £100 to any person who may bring to their notice an invention, publication, diagram, etc., which, in the opinion of the judges appointed by the Council, is considered to be an advancement in the Science or Practice of Navigation, proposed or invented by himself in the period January 1st, 1930, to December 31st, 1935.

II.—Prize for an Essay

A prize of £100 for an essay on the following subject :—

Modern Navigational Appliances

1. Appliances made possible by electricity on board, *e.g.*, Wireless D.F., Echo Sounding, Gyroscope, etc.
2. Appliances not depending on electricity, *e.g.*, Range Finding, Sounding Machine, Compass, etc.

The Judges' awards in connection with these prizes were announced in the *Journal* dated March 13th.

Similar prizes for an invention and an essay, particulars of which were published in the *Journal* dated March 27th, are offered for 1936.

Award of Silver Medal

The Silver Medal, awarded annually under the Thomas Gray Memorial Trust to the candidate who obtains the highest number of marks in the Board of Trade Extra Master Examination was awarded to William Edward Bertram Griffiths, of Plymouth, for the year 1935.

Thomas Gray Memorial Challenge Shield

The examination for the Thomas Gray Memorial Challenge Shield, which was instituted in 1931 to encourage the study of Navigation at the Nautical College, Pangbourne, and the training ships H.M.S. *Worcester* and H.M.S. *Conway*, was held last November for the fifth time, when the shield was won by H.M.S. *Worcester*.

Prizes to other Training Ships

The Council awarded the following prizes, in the schools mentioned below, for the year 1935–36, to the boy in each ship who, in the opinion of the masters and staff, possessed the qualities which will make the finest sailor :—

A prize of £10 to the South Africa T.S. *General Botha*.

Three prizes of £5 each to *Arethusa*, London; *Warspite*, London; *Indefatigable*, London.

Prizes for Nautical Courses

The examinations for prizes for Junior Nautical Courses and Cadet Courses have now been combined, and the first of the joint examinations was held on June 17th at four schools, the Technical College, Cardiff, the Sir John Cass Technical Institute, the Royal Technical College, Glasgow, and the Nautical School, Hull. The results of the examination are not yet announced.

XII.—EXAMINATIONS

The total number of entries for the ordinary examinations held at Easter, Whitsuntide, and in July, 1936, was 72,309. The number of entries for the London County Council Grouped Course Examination (conducted at the request of the

London County Council for Junior Commercial and Junior Technical Institutes), was 2,452, each candidate working three papers. For the School and Senior School Certificate Examinations the entries were 38 and 1,045 respectively; each candidate in these examinations must work seven, and may work nine, papers. The total number of papers applied for in all the examinations was 91,328, as compared with 82,313 in 1935—an increase of 9,015.

Fourteen Centres entered candidates for the examinations under the Joint Scheme of the Royal Society of Arts and the London Chamber of Commerce for the Board of Education Endorsed Certificate in Commerce. 178 papers were worked in the First Year's Course, and 12 in the Second Year's Course.

A good deal of interest has been taken in the new Transport examinations for administrative and operative staffs of road transport undertakings, but many prospective candidates were unable to prepare for the examinations owing to the fact that there were no classes available in their district. This is likely to be remedied next session, when classes in transport work will be set up at all important centres. The number of papers worked in May at these new examinations may be considered satisfactory ; the figures are as follows :—

Group I—938 ; Group II—36 ; Group III—40.

The liberality of the Worshipful Company of Clothworkers has enabled the Council, as in past years, to offer the usual silver and bronze medals. These medals are greatly valued by the successful candidates, and they contribute not a little to maintain the high standard of the examinations. The Oral Examinations are still in progress in various parts of the country. Particulars will be given in the annual report on the Examinations.

XIII.—NEW COUNCIL

The Vice-Presidents retiring under the regulations are : Major the Hon. John Jacob Astor, M.P., Sir Julien Cahn, Bt., Major-General Sir Percy Cox, Sir Robert A. Hadfield, Bt., F.R.S., Captain Owen Jones, Sir Richard Redmayne, Viscount Wakefield and Sir Henry S. Wellcome, F.R.S. To fill the vacancies thus created the Council recommend Sir David T. Chadwick, Mr. Alan E. L. Chorlton, M.P., Sir William H. Davison, M.P., Vice-Admiral Sir H. Percy Douglas, Sir E. Montague Hughman, Sir Harry A. F. Lindsay, Mr. Clifford C Paterson and Mr. Harold W. Sanderson.

The Ordinary Members retiring under the regulations are : Sir Felix Brunner, Bt., Sir William H. Davison, M.P. ; Sir Herbert Jackson, F.R.S., Mr. Harold W. Sanderson and Lord Sempill. In their places the Council recommend Major John Sewell Courtauld, M.P., Mr. John de La Valette, Sir Paul Latham, Bt., M.P., Sir Kenneth Lee and Mr. W. J. U. Woolcock.

XIV.—OBITUARY

The Council record with much regret the deaths of a number of distinguished Fellows during the past twelve months.

Colonel Maharaja Sir Jai Chand of Lambagraon belonged to one of the most ancient families in India and was one of the most cultured Indian gentlemen in the Punjab.

Sir Basil Blackett, whose career was cut short by a motoring accident in Germany at the early age of 53, was Finance Member of the Viceroy's Council during the Vice-royalty of Lord Reading, and had an international reputation in financial matters. He was a Vice-President of the Society from 1930 to 1933.

Sir Charles Stuart Bayley had a distinguished career in the Indian Civil Service, where he occupied many important positions, including the Lieutenant-Governorships of Eastern Bengal and Assam, and Bihar and Orissa. He was a Fellow of the Society for 26 years, being Chairman of the Indian Section from 1920 to 1924, and a member of the Council from 1920 until 1933.

Sir Albert Humphries was one of the leading personalities in the flour-milling industry.

The Earl of Dysart was a large landowner and for many years Lord-Lieutenant of the County of Rutland. He had been a Fellow of the Society for over 50 years.

Rear-Admiral James de Courcy Hamilton, M.V.O., after retiring from the Navy, was Chief Officer of the London Fire Brigade from 1903 to 1909. He was a Fellow of the Society for thirty years, during twelve of which he was member of the Council.

Obituary notices of these Fellows have appeared in the *Journal* since the last Annual General Meeting.

XV.—FINANCE

In the Income and Expenditure Account for 1934 the deficit which for the preceding year, 1933, had been £1,067, was reduced to £194. In the Income and Expenditure Account included in the Financial Statement for 1935, which in accordance with Section 25 of the Society's Bye-laws was published in the *Journal* of June 12th, this deficit has been turned into a credit balance of £1,851. This satisfactory position is due partly to an improvement in the financial results of the Society's examinations, which in 1934 showed a deficit of £817, and partly to the fact that new Fellows are now joining the Society in larger numbers, of which evidence is given in the monthly lists published in the *Journal.* If this tendency is maintained—and it is hoped that by enlisting the interest of their friends in the Society's activities Fellows will help to maintain it—the financial position will continue to be satisfactory.

The Chairman, before moving the adoption of the Report, said: I feel I must first refer to the great loss which the Society has sustained by the lamented death of our Patron, His Majesty King George V. Such particulars of his late Majesty's long association with the Society, extending over more than forty years, are given in the opening paragraphs of the Report.

The office of Patron of the Society, thus rendered vacant, has, as you know, been graciously accepted by our present King, His Majesty King Edward VIII, who, as Prince of Wales and the Society's Vice-Patron, has already given evidence of his interest in the Society's work, especially in the field of industrial art, by taking an active part, as President of the General Committee, in the organisation of the Exhibition of British Art in Industry held at the Royal Academy last year.

The financial outlook is good, and it may be hoped that after a series of years, since and including 1927, in which unfortunately a deficit has had to be shown on the year's work, we have now turned the corner. The recent increase in the number of new Fellows has contributed to this, as well as a marked improvement in the Examination figures, the number of entries for this year's Examinations being 91,328, an increase of 9,015 on last year.

The papers and lectures which have been delivered at the Society's meetings, of each of which a brief summary is provided in the Report, have maintained, and I venture to think, surpassed, the usual high standard which our experience in past years has taught us to expect.

You will be interested to hear that there is a possibility that the Competition of Industrial Designs, which was held by the Society for a period of ten years, from 1924 to 1933, may be revived. The last Exhibition of Designs was held in the summer of 1933, when the Competition had to be abandoned for financial reasons. A Committee of the Council is now exploring the possibilities of reviving the Competition in perhaps a rather different form, and are taking steps to ascertain the views of representative persons in the various trades concerned, both as to the desirability of holding such Competitions and as to the willingness of these trades to made adequate contributions to their cost. The object of these Competitions is to bring promising young designers to the notice of manufacturers, some of whom, I regret to say, are understood at present to obtain a number of their designs from foreign sources. We believe that it ought not to be necessary for a country which in the past has produced such great designers as the Adam Brothers, Chippendale, Sheraton, John Flaxman and William Morris (to mention only a few) to rely upon the talent of foreign countries, and we think that any properly thought-out effort to encourage our native designers ought to receive the hearty support of British manufacturers.

The Chairman then moved the adoption of the Report.

SIR CHARLES H. ARMSTRONG seconded the motion, and the Report was unanimously adopted.

The new list of Council having been suspended in the Library, in accordance with the Bye-Laws, and no additional nominations having been made, the Chairman called on the Secretary to announce the new Council for 1936–37, and the following were declared to fill the several offices. (The names in italics are of those Fellows who have not, during the past year, filled the office to which they have been elected):—

President

H.R.H. The Duke of Connaught and Strathearn, K.G.

Vice-Presidents

(*Twenty-four to be elected*)

Lord Amulree, P.C., G.B.E., K.C.
F. H. Andrews, O.B.E.
E. F. Armstrong, Ph.D., D.Sc., F.R.S.
*Lord Askwith, K.C.B., K.C., D.C.L.
Viscount Bledisloe, P.C., G.C.M.G., K.B.E.
Sir David T. Chadwick, C.S.I., C.I.E.
Alan E. L. Chorlton, C.B.E., M.P., M.Inst.C.E., M.I.Mech.E., M.I.E.E.
Sir William Henry Davison, K.B.E., D.L., M.P.
Vice-Admiral Sir H. Percy Douglas, K.C.B., C.M.G.
Peter MacIntyre Evans, C.B.E., M.A., LL.D.
*Sir Edward A. Gait, K.C.S.I., C.I.E.
Sir Reginald Glancy, K.C.S.I., K.C.I.E.
Sir Thomas Henderson
Sir E. Montague Hughman
Major Sir Humphrey Leggett, R.E., D.S.O.
Sir Harry A. F. Lindsay, K.C.I.E., C.B.E.
Major-General Sir Robert McCarrison, C.I.E., M.D., D.Sc., LL.D. F.R.S.P.
Col. Sir Henry McMahon, C.C.M.G., G.C.V.O., K.C.I.E., C.S.I.
Sir Reginald A. Mant, K.C.S.I., K.C.I.E.
*John A. Milne, C.B.E.
Clifford C. Paterson, O.B.E., M.I.E.E.
Tom Purvis
Harold W. Sanderson
*Carmichael Thomas

* Nominated by H.R.H. the President.

Ordinary Members of Council

(*Twelve to be elected*)

Major John Sewell Courtauld, M.C., M.P.
John de La Valette
Ernest W. Goodale, M.C.
Charles Geoffrey Holme, M.B.E.
Basil Ionides
Sir Paul Latham, Bt., M.P.
Sir Kenneth Lee, LL.D.
G. K. Menzies, C.B.E.
Oswald Milne, F.R.I.B.A.
Brigadier Sir Edward A. Tandy
Henry T. Tizard, C.B., A.F.C., F.R.S.
W. J. U. Woolcock, C.M.G., C.B.E.

Treasurers

(*Two to be elected*)

Sir Charles H. Armstrong
Sir Atul C. Chatterjee, G.C.I.E., K.C.S.I.

THE CHAIRMAN said: It is my duty and privilege to propose a hearty vote of thanks to those who assist us in carrying on the work during the year—I refer to the Secretary and our staff. During the past year we have to lose, I regret to say, the services of that very old member of the staff, Mr. Dack, and you will be glad to hear that as far as we know he is enjoying his freedom from work and that he is in good health. We are very much indebted to our staff, and may I say we are very satisfied with the way in which our Secretary has carried on his duties in the past year of his very important charge. I feel sure that you will all assist in that vote of thanks, and I would ask you to express it in the usual way.

The vote of thanks was carried unanimously.

THE SECRETARY, in acknowledging the vote, said he believed he could truly say that everybody on the staff had worked exceedingly well and in the greatest harmony, and he did not think one could say anything much better than that.

MR. J. A. MILNE, C.B.E., said: Before we leave this meeting I should like to propose a very hearty vote of thanks to our Chairman. In view of the many high offices he has held, and his very wide and varied knowledge and experience of men and affairs, I think he is most ideally equipped to be Chairman of this great Society, and we are very fortunate in having his services. To my mind Sir Henry is possessed of one very valuable asset, and that is, he does not allow himself to be unduly perturbed by troubles and difficulties. In fact, there are times when he almost appears to treat them with an air of diffidence. At the same time he not only faces them, but almost invariably surmounts them, and very often to the accompaniment of a most disarming smile. Perhaps that is one of the reasons why he has discovered the secret of perennial youth. It is my pleasure and privilege to know Sir Henry intimately, and I always regard him as a veritable Peter Pan.

THE CHAIRMAN briefly acknowledged the vote of thanks, and the meeting terminated.

NOTES ON BOOKS

WILLIAM HOLMAN HUNT. By A. C. Gissing. London: Duckworth. *7s. 6d.*

This is a carefully written biography, and it will interest all who are attached to the painter, the period, or the history of art in this country. One might add: or to Eminence among the Victorians.

For Hunt was, and looked, an Eminent Victorian, and his behaviour was never out of character, not even when he married *en secondes noces* his deceased wife's sister. He would not have done this if he had thought the law which forbade it was just, and after he had done it he wrote and preached in favour of reform. He detested immorality as much as he loved what he believed to be goodness and beauty; and so he succumbed to the one serious temptation which was always getting the better of Eminent Victorians. He judged—and he has been judged. He has been judged an astonishing, in a way an important, but not really a great painter.

Of course, Michelangelo judged too—only whereas he thought Flemish painting

bad because it was finicky, Hunt thought Impressionism bad because its origins were to be sought in what he regarded as typical Parisian conditions, that is, in debauchery and idleness. It seems only right that at least once in his life Hunt was subjected to some violent moralising from as sturdy a moralist as himself. Carlyle broke out at him over " The Light of the World," called it a papistical fancy, said it was inane, and screamed at him the advice that he had better leave mysteries alone.

In a way this biography gains from Mr. Gissing's acquiescence in every one of his hero's attitudes and foibles. We know where we are when the case for Hunt is stated with such simplicity and directness ; we find out more about Hunt like this than if the narrative had been punctuated with criticism.

Like Ruskin and Morris he was the son of a London business man. Like Ruskin and Morris he enjoyed and suffered from the friendship of Rossetti. Unlike Ruskin and Morris he had to struggle with poverty, but, fortified by a great spirit and inspired by his religious fundamentalism, helped also by the patronage of Mr. Augustus Egg, he overcame material difficulties ; he achieved the kind of success at which he had steadily aimed from the beginning. He was an extraordinary craftsman, and his painting will never be ignored or underrated, even though it does not come up to the work of some of those low-life Parisians.

THE ENGLISH ABBEY. By F. H. Crossley. London : B. T. Batsford, Ltd. 7*s*. 6*d*.

This addition to Messrs. Batsford's *British Heritage Series* is a historical as well as an archæological work of some substance. Mr. Crossley has not only described for us the surviving abbeys and ruins of abbeys in England ; he has carefully reconstructed the mediæval circumstances on which they depended and which they so greatly influenced. They remain a monument to a lost civilisation. The emphasis of life has changed so much since Henry VIII struck his cruel blow at monasticism, that even readers with more than a smattering of history will not feel much at home in the world that is Mr. Crossley's subject—in many ways a fascinating world, but not ours. Better, worse, lying half in the shadow of discredited superstitions, half lit by a bright star of holy aspiration ; quite a different world from ours.

It is sometimes tempting to conjecture that the monastic discipline came into existence through the operation of a sort of natural law of compensation. When some men were so brutal and godless, others maintained the balance of humanity by practising austerities, and devoting themselves to God and their fellow creatures. The Benedictines, for instance, provided early mediæval Europe with a *cadre* of culture. Their successors—Cluniacs, Cistercians and others—were more self-regarding ; but the four Orders of Friars, of still later origin, made it their business, as Mr. Crossley says, " to reach the masses " ; they set out to be actively philanthropic.

With the ideological and economic revolutions of the fifteenth century came a swing from piety towards knowledge. The monastic system began to crumble. But the monks and friars had builded well. The likes of their beautiful abbeys are not being built to-day. The Glory of God, after all, has proved more inspiring even than the convenience of directors of companies and their secretaries. Church plans had, of course, not developed *in vacuo* : there were reasons for every structural detail being where it was—physical reasons and symbolic ones—but a margin was always left for the useless, emotional element of beauty ; and a wide margin at that.

Mr. Crossley admirably describes the abbey churches and their appended offices, cloisters and outbuildings ; and he deals with the officials too, from the abbot at one end of the scale to the *conversi*, or hired servants, at the other. Then he has a chapter called " Social Reactions " to complete the survey. Both in plan and

execution his book is sound, and it is very readable and well illustrated. It is possible at the same time to look on it as a guide book to monastic remains in this country. Mr. Crossley has not omitted to provide us with a map and with a list of abbeys arranged under counties. Many of the abbeys no longer in use (but very picturesque in decay) are now happily under the guardianship of H.M. Office of Works.

P.B.

SOME MODERN FOOD PROBLEMS

No commodity either in Britain or the United States is more closely scrutinised and more rigidly controlled to-day than food : in no other sphere of activity is the police work so efficient and so organised.

The work in this country is done by a highly qualified body of men, the public analysts aided by the chemists engaged in the food industry, who, quite contrary to what is sometimes expressed in the press and elsewhere, are concerned in maintaining the quality of food and not in its sophistication. The changing habits of the people, their aggregation in towns, the substitution of the house by the flat, have brought for solution new problems in the transport, distribution and keeping of food. Some of these problems concern the presence of very small quantities of extraneous substances, which may or may not be harmful either generally or to susceptible subjects. The fact that they are recognised as problems and are being studied both chemically and medically is evidence of the watchfulness of the authorities, which include the Ministry of Health.

It is worth while to indicate some of them as evidence of their complexity and particularly to show the way in which new discoveries can affect former conclusions. The first example is in connection with white flour, which, for reasons which it would take too long to indicate, is preferred to the natural yellow-tinted flour. Whiteness is by tradition a mark of the purity of everything that is nearly white, though generally the criterion is a wrong one. The yellow pigment in flour is due to the presence of a little of the plant pigment, carotene, which is easily bleached by oxidation. This takes place naturally on storing the flour for some time, and instantaneously on treatment with traces of chemical oxidising agents. It was claimed some years ago that merely hastening a natural oxidation could not do harm, and that the flour was improved by the treatment. We now know, however, that carotene may be of value to us as a precursor of vitamin and have significance in the nutrition of those people who live largely on bread, and it is even possible that flour may contain other vitamins destroyed by oxidation. It is clear that it is preferable and wiser to abandon the bleaching treatment of flour, and for the consumer to cease to judge it by its whiteness of colour.

Carotene is also responsible for the yellow colouring matter of butter, which somehow the public has found to be more appetising when it is coloured than when it is pale. Now summer butter contains much more carotene and is more highly coloured than winter butter, owing to the difference in the feeding of the cattle in these two seasons of the year. In consequence, it has long been the habit artificially to colour winter butter with harmless colouring matters, this being regarded as a purely innocent action on the part of the producer to increase the pleasure of eating butter. The new knowledge about accessory food substances has, however, taught that winter butter produced by stall-fed cattle contains much less vitamin than summer butter, so that we must come to the conclusion that the yellow colour due to carotene is to some extent an indication of the dietetic value of the butter. Once this fact is accepted, the addition of colour to butter becomes definitely improper.

A word may be devoted to another butter ingredient, which gives to it the

characteristic aroma, lately identified as diacetyl. This substance can be made artificially, and an addition of it can be used to give aroma to butter which is deficient in this respect Unfortunately, diacetyl besides giving aroma accelerates the oxidative changes which give rise to rancidity, and may destroy the vitamins, and it is well known that butter for export must be well washed before despatch. Hence the addition of diacetyl may conceivably do harm to the butter, although it improves the flavour, and thus it may defeat its own object. The physiology of the effect of very small amounts of such active substances in the stomach has still to be studied.

The foregoing are typical problems of present-day food chemistry.

GENERAL NOTE

Central School of Arts and Crafts.—The work shown at the exhibition in Southampton Row again touches the high level of recent years, and the variety of objects shown is even greater than before. A reserve of talent and technique is being built up. In a generation's time the face of England ought to be much improved.

The pottery is good and straightforward, the stoneware perhaps the most engaging—fine solid stuff in a good old tradition. It is not an urban taste, but after all there is still some country left. There has also long been a demand for mosaic in England, though only for the dullest kind. This year the Central School shows some ambitious designs. Let institutions, including public-houses, take note. Mosaic is a grand art, with an agreeable element of manual labour. The craftsmen in leather, not content with binding books, have produced some delightful tubular manuscript containers. The furniture is satisfying, if a little guarded, but this does not apply to a fine sideboard by W. C. Woods, who has departed a little from the fashionable austerity and allowed curves to come back. Extremes of ancient and modern taste meet in the most friendly way in a stitchery picture by M. Booker, a lady also skilled in mosaic work. In sculpture the opposite poles are not ancient and modern, but (as one might expect) the influences of Mr. Epstein and Mr. Henry Moore. One student has a good bronze head in the style of the former. E. Pincombe has an amusing sculptured ceramic figurine. It is very rare to find a good example of this kind of grotesque nowadays.

As usual, all the graphic art is good except the painting, which is inclined to be sluggish ; and there is not much of it. To single the students out is rather unfair ; nevertheless, it is too tempting to mention Wendela Boreel for her little aquatint, a view of a square through the rails of a balcony. C. Englefield risks relapsing into a rather prim convention, still his (or her) prints of animal figures are charming. Jean Young draws animals with a vigorous pencil ; the cave men of primeval Altamira would appreciate them, and John Citizen to-day should like them no less. There is much good lithography. The miserable line-block is responsible for the dullness of so much contemporary illustration and caricature—let us go back to the lithography of the nineteenth century and not be proud.

The students who have applied themselves to commercial art show freshness and a right spirit. Their book-jackets, posters and cardboard boxes are attractive. G. Keith Beattie's design for a box for " Lectro " light bulbs is excellent.

As for textiles, the general impression made by the materials and designs for patterns is good, but the individual examples are not often more than pleasant. Their pleasantness is sane and suitable, suitable, that is, for any typical modern interior in which order predominates over ornament. One waits impatiently for ornament to return without disturbing the order. The ideal is the classical one of the best of both worlds. P.B.

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PRESENTATION OF THE SOCIETY'S ALBERT MEDAL BY H.R.H. THE DUKE OF CONNAUGHT

The Council of the Royal Society of Arts attended at Clarence House on July 13th, when H.R.H. the Duke of Connaught, President of the Society, presented the Society's Albert Medal for 1936 to the Earl of Derby, K.G., " for the advancement of Commerce and Arts, especially in Lancashire."

The members of the Council present were: Colonel Sir Henry McMahon, G.C.M.G., G.C.V.O., K.C.I.E., C.S.I. (Chairman); Mr. F. H. Andrews, O.B.E.; Lord Askwith, K.C.B., K.C., D.C.L.; Viscount Bledisloe, P.C., G.C.M.G., K.B.E.; Sir Felix Brunner, Bt.; Major-General Sir Percy Cox, G.C.M.G., G.C.I.E., K.C.S.I.; Mr. P. M. Evans, C.B.E., LL.D.; Sir Edward A. Gait, K.C.S.I., C.I.E.; Mr. Ernest W. Goodale, M.C.; Sir Robert Hadfield, Bt., D.Sc., F.R.S.; Mr. C. G. Holme, M.B.E.; Major Sir Humphrey Leggett, R.E., D.S.O.; Major-General Sir Robert McCarrison, C.I.E., M.D., D.Sc.; Sir Reginald Mant, K.C.S.I., K.C.I.E.; Mr. G. K. Menzies, C.B.E.; Mr. John A. Milne, C.B.E.; Mr. Harold W. Sanderson, Mr. Carmichael Thomas and Viscount Wakefield, C.B.E., LL.D., with Mr. W. Perry (Secretary) and Mr. K. W. Luckhurst (Assistant Secretary).

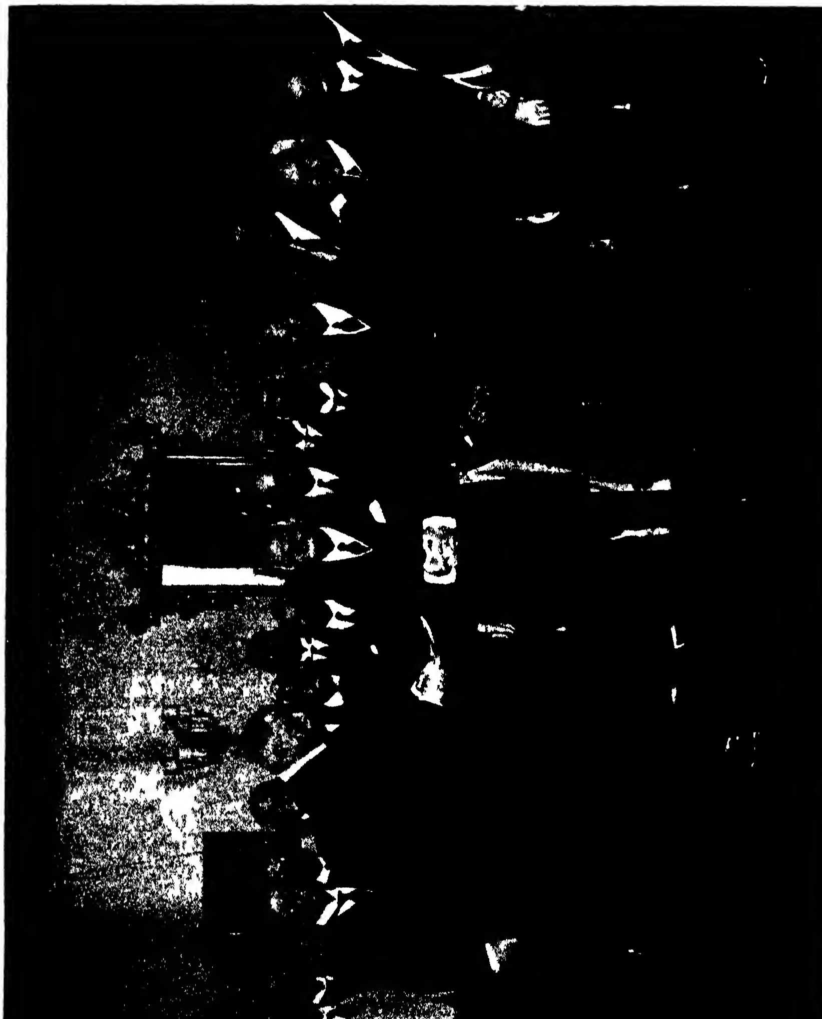
Captain FitzRoy H. Fyers was in attendance upon His Royal Highness.

In making the presentation the Duke of Connaught said :—

" As President of the Royal Society of Arts it has given me great satisfaction to approve the award to you of the Albert Medal of the Society.

This Medal, which is a very coveted award, was instituted in memory of my beloved father, the Prince Consort, who for many years as President of the Society took an active part in the conduct of its affairs. In that capacity he was instrumental in promoting the Great Exhibition of 1851, which has proved of lasting benefit to the arts and the industry of this country.

Last year, the great work instituted by my father was further perpetuated by the



Presentation of the Albert Medal for 1936 by H.R.H. the Duke of Connaught to the Earl of Derby, K.G., at Clarence House

Exhibition of British Art in Industry at Burlington House, which was promoted by the Royal Society of Arts under my Presidency. The effects of this Exhibition are only now beginning to be felt, but it has already proved a great stimulus to the textile industry, the interests of which you have done so much to advance. That industry, more especially in Lancashire, has reason to be deeply grateful to you for the great services you have rendered it. Your great influence in helping the trade of this country, often under adverse conditions, has never been sought in vain. As President of the British Textiles Exhibition, the Lancashire Industrial Development Council, and other important bodies, your work has been invaluable to the furtherance of industry, while as Patron of the British Colour Council you have contributed in no small measure to the realisation of the paramount importance of colour and design to the industries of the country and the Empire.

Your many other claims to distinction are universally acknowledged, and, on a personal note, I am not unmindful of the fact that you served for many years in the Grenadier Guards, of which I am Colonel.

I have special pleasure in handing you this Medal, which has been awarded to you for ' the advancement of Commerce and Arts, especially in Lancashire.' "

The Earl of Derby, in reply, said :—

" May I be permitted, Sir, to thank you as President, and the members of the Council of the Royal Society for the Encouragement of Arts, Manufactures and Commerce, for having awarded me the Albert Medal for this year.

Much as I value their action, may I say, Sir, the value is greatly enhanced by the fact that I receive it at the hands of Your Royal Highness, who has known me from my earliest days and who has always shown such personal kindness to myself and to my family. I especially thank Your Royal Highness for honouring me by your reference to myself as a brother officer of yours in the Grenadiers.

Your Royal Highness has mentioned that the creation of this Medal was due to the initiative of Your Royal Highness's illustrious father, the Prince Consort. It is a great pleasure to me to think that in this way I am connected with the work of one who, by that great Exhibition which was due to his initiative, did so much for the Art and Commerce of this Country.

But may I remind Your Royal Highness, though I do not think you perhaps require reminding, that I am also indebted to the Prince Consort for something else—for Wellington College, whose foundation was entirely due to his initiative. Not only did I receive such education as I possess there, but I have had the honour, ever since the death of my father, to serve as Vice-President of that college under the Presidency of Your Royal Highness, and knowing as I do the great interest that Your Royal Highness takes, not only in the Royal Society of Arts but in Wellington College, I do esteem myself most fortunate to be the recipient this year of the much coveted annual Medal.

Your Royal Highness has been good enough to refer to my work in Lancashire. I think you know me well enough, Sir, to realise that anything I can do in that county is a labour of love and not only a duty that I feel I owe to the people amongst whom I live. This is a time when everybody who can do anything ought to do something for his neighbours and, if I may say so, there is always work at hand that can be done.

I feel that I do not deserve all that Your Royal Highness has been good enough to say about me, but I can claim to have done all that I can.

The return of prosperity to Lancashire cannot rest on the work of any one man. It must depend on the work of all pulling together and on the co-operation of bodies like the Textile Committee of the British Industries Fair and the Colour Council.

I see distinct signs of improvement, and the credit for that must be given, not to any individual, but to the pluck and determination of the people of the county.

I thank Your Royal Highness again for the great honour that you have done me and I hope, although I do not feel I am worthy of receiving this great reward, that my actions and work in the future may be found not to render unjustifiable the granting of the honour."

PROCEEDINGS OF THE SOCIETY

DOMINIONS AND COLONIES SECTION

TUESDAY, 26TH MAY, 1936

SIR DAVID T. CHADWICK, C.S.I., C.I.E., Secretary, Imperial Agricultural Bureaux, in the Chair

THE CHAIRMAN, in opening the meeting, said : It is one of the glories of the Royal Society of Arts that so frequently true searchers after knowledge have come to its platform to explain the practical objectives of their efforts and their general methods of work. Professor Munro belongs to that group which I have just described. It would be correct to speak of his work, and that of the men associated with him, as throwing new light on old problems. How to prevent insect attack and damage to our belongings must have perplexed mankind always, since the first crop was harvested or the first garment sold. We all have experience of it very close at home, because protection from insect damage is surely one of the reasons for that time-honoured custom known as " turning out the room," which becomes glorified once a year into spring-cleaning. I think we also know that the virtue in that custom is the thoroughness with which it is done.

If we turn to products in transport, in the warehouse, or in the shop, the difficulty of preventing insect attack is very much greater, and the result of neglect or failure to prevent that attack is much more costly, and therefore it is above all necessary that the measures taken should be thorough. It is there I think that Professor Munro's work is chiefly distinguished. They at Slough have recognised and accept the full implication of the word thoroughness. All measures taken must be based on detailed knowledge, checked by experiment and test at every stage and in every aspect. It is not work for one man only, but concerns the entomologist, the chemist, the physicist and the engineer. It is in that team spirit that this work has been done. Quite rightly it is gaining increasing recognition on its merits, and promises, I think, to make great changes in all the methods hitherto adopted in preventing insect infestation in large quantities of goods in any closed space.

The following paper was then read :—

INSECT DAMAGE TO EMPIRE PRODUCTS

By J. W. MUNRO, M.A., D.Sc.

Professor of Zoology and Applied Entomology in the University of London

Although the depredations of insects on growing crops have long received attention and agricultural entomology is throughout the Empire a highly valued and

reasonably well-supported branch of biological science, the depredations of insects on harvested produce have been strangely neglected. Except in times of stress, as during the Great War, losses to produce in store have been accepted as a necessary evil, and stored products entomology has until quite recently existed rather as a branch of applied entomology cited in the text books than as a really active field of work. Since the war, economic conditions have forced a fuller recognition of the insect problems arising in the storage, transport and marketing of Empire produce and stored products entomology is slowly receiving recognition.

I propose briefly to describe what these insect problems are, how far they are being tackled in the Empire, and what work and organisation is still necessary for reasonably good control of insect infestation of stored foodstuffs and other raw materials.

Nearly all kinds of organic produce suffer from insect infestation during storage, but naturally the greater the volume of the product and the greater its value, the more evident is the infestation. With the exception of tea, all the more important Empire products suffer more or less severely, notably cocoa, dried fruits, nuts and spices, tobacco and grain. Infestation of these commodities may occur at any stage in the handling of them after harvesting and, broadly speaking, we may say that infestation in the producing country, both prior to and during storage there, on shipboard or other conveyance during transport, and in the exporting country during storage both at the ports and inland, is universal.

It is difficult to assess the monetary loss caused by this infestation. In the United States of America widely differing figures have been given of the annual losses in that country, ranging from millions to tens of millions of dollars. The wide disparity in the figures quoted indicates the difficulty of assessment. My own view is that the extent of financial loss should ultimately be measured by the sums which those concerned are prepared to expend in preventing or controlling loss, but even here a difficulty arises because there is a natural tendency for each branch of industry or commerce to pass its losses on to the next until ultimately the loss may be spread very widely among the consumers. This passing of loss is, however, becoming more difficult and when, as has happened in the dried fruits, tobacco and cocoa industries, insect infestation has become too severe to allow of the losses being passed on, it is possible to get some idea of their extent. In 1929 and 1930 the value of tobacco leaf infested by the moth, *Ephestia elutella*, was reduced by 40 to 50 per cent., and direct and indirect losses sustained by the tobacco trade as a result of infestation of African tobacco was, in round figures, at least £100,000. In the Australian dried fruits trade it may be sufficient to say that infestation of dried fruits by the moth, *Plodia interpunctella*, was so serious that in 1932 this fruit was being marketed with the greatest difficulty and many thousands of pounds have been spent in remedying these adverse conditions.

The insects which infest stored products do not belong to any one group; upwards of two hundred species infest or occur in the major Empire products just cited, and they represent many natural orders and families of insects. Of

these, however, much the most important are the Lepidoptera, or moths, and the Coleoptera, or beetles. Of the moths members of the family Phycitidae are especially important, and among the beetles members of the families Curculionidae, Anthribidae, Tenebrionidae, Dermestidae and Cucujidae are the more important. In these families the major pests are the moths of the genera *Ephestia* and *Plodia*, the Curculionid beetles of the genus *Sitophilus*, commonly known as grain weevils, the Anthribid beetle *Araecerus fasciculatus*, a serious pest of nutmegs and of cocoa, the Tenebrionid beetles of the genera *Tribolium* and *Gnathocerus*, the Dermestid beetles of the genera *Dermestes* and *Trogoderma*, and the Cucujid beetles of the genus *Oryzaephilus*.

All these insects undergo during their development what is commonly called "complete metamorphosis." They begin life in the egg stage, emerge from this into the larval stage as grubs or caterpillars, then pupate, and finally emerge as the adult or perfect insects. All growth in size of these insects and practically all feeding for development takes place in the larval stage. A knowledge of the development and biology of these insects is basic to an understanding of the measures used to keep them in check, and I think I can best illustrate the importance of this by referring to the moths of the genera *Ephestia* and *Plodia* which, as I have said, are among the most important of all the stored products insects.

The genus *Ephestia* comprises about sixty species of small moths about ½ inch long in body length and 1½ inches in wing span. Not all of them have importance as pests of stored products, and I propose to mention only two species which will illustrate their biology. The first of these is the so-called flour moth, *Ephestia kühniella* Z., which is pre-eminently a pest of flour, but attacks all kinds of starchy foodstuffs including potatoes and soya beans. The features of this moth biologically are that in steam mills and heated warehouses, as in the laboratory, it continues to breed all the year round, giving three to five generations in the year according to the temperature prevailing. The second *Ephestia* is the so-called cocoa moth, *Ephestia elutella* Hb., which is widely known as a pest of cocoa, but which has recently proved a serious pest of tobacco and attacks an enormous number of other products. This moth differs from *Ephestia kühniella* in its biology, because in warm warehouses and under laboratory conditions it produces only two broods, or two broods and part of a third, during a year but never more. The second brood, and in rare cases the third brood, when they reach the final stages of larval development become dormant, or in entomological parlance go into diapause, and nothing that the entomologist can do has so far succeeded in breaking that dormancy.

The genus *Plodia*, which is very closely allied to the genus *Ephestia*, comprises only two species, of which only one is important, the Indian meal or dried fruit moth, *Plodia interpunctella* Hb. This insect resembles *Ephestia kühniella* in its biology in that its rates of growth and reproduction are more governed by temperature than those of *Ephestia elutella*, but it resembles *Ephestia elutella* in

that it goes into a dormant state in the winter time as if it obeyed a seasonal rhythm.

All three of these species when fully or almost fully grown larvæ exhibit a remarkable habit of leaving their foodstuffs and wandering widely in mills and warehouses. At the end of this wandering phase they seek some cranny or crevice into which they can tightly ensconce themselves and there pupate or become dormant as the case may be. As we shall see later, these two phenomena of going into dormancy and of wandering are of enormous importance from a practical point of view.

One other feature of the biology of these moths deserves mention. It is commonly supposed that insects which undergo complete metamorphosis emerge from pupation fully developed in all respects and require no further feeding, but in these moths some form of feeding is necessary before they can lay eggs. One of my staff, Mrs. Richards, has shown that the number of eggs laid by these moths depends on the extent to which they have access to water.

With that brief summary of the main features of the biology of these moths, I may now pass to the question of control measures used against stored products pests. I think it may be helpful if I consider first the theoretical aspects of control and then the practical. In general, control measures against insects may be divided into three main groups, physical, chemical and biological. The term " biological control " has recently been used to describe the control of insects by setting their parasites against them; this is a somewhat too restricted use of the term " biological control," but it is now so general that we may have to accept it. I may say at once that for a number of reasons this form of control is not applicable to stored products infestation; of these the chief reasons are that stored products insects are cosmopolitan in distribution, their parasites, as we know them, are equally cosmopolitan, and finally, a very practical reason, merchants and consumers have just as much objection to the presence of parasite larvæ or cocoons on their foodstuffs as they have to the presence of caterpillars. For these reasons I propose to confine myself to the physical and chemical control measures.

Physical control measures, in so far as they can be practised to-day, consist in the main in the use of high or of low temperatures and, to a lesser extent, of high or of low humidity. High temperatures where they can be applied are commonly used to destroy the insects outright. Low temperatures may be used both for that purpose and for so reducing development and increase of the insects as to render them innocuous until the infested products can be manufactured. During recent years a considerable amount of work has been done on the effect of high and low temperatures on insects but, at the moment, I am afraid we ought, as scientists, to admit that our knowledge of the action of high and low temperatures is far from complete. We do not yet know why moderately high temperatures kill insects. Two explanations which have been offered, that they cause death by dessication of the insects or that they cause coagulation of their protein, are not entirely satisfactory. I think it sufficient merely to mention that. Meanwhile

it may be interesting to consider some of the factors which govern the effects of high and low temperatures.

Mansbridge, working in my department, has shown that the effect of high temperature on the flour moth varies with the rate of metabolism ; the higher the rate of metabolism the greater the effect of temperature.

With regard to low temperature, the early work of Bachmetjew and the more recent work of Robinson, Payne and others show that insects can withstand a gradual reduction of temperature to a degree markedly lower than that which is fatal to them if the drop in temperature is rapid. Under laboratory conditions and in field conditions where the insects are exposed to the immediate effects of fall in temperature, a rapid fall is frequently fatal to them, but where the insects occur in bales of tobacco or in bags of cocoa a sudden drop in temperature can rarely be obtained because of the lag in fall of temperature between that of the atmosphere of the chamber and of the goods treated. For example, Bovingdon has shown that it takes three weeks to cool a hogshead of tobacco from 58° Fahrenheit to 4° Fahrenheit and it is evident that under these conditions the fall must be a gradual one and the lethal temperature will therefore be low.

Of the action of low temperature we know not much more than we know concerning the action of high temperature. There is some evidence that on cooling an insect tends to lose water, and if this process takes place until the only water remaining in the insect is water in a so-called bound or colloidal form the insect is remarkably resistant. If, however, the fall of temperature is rapid and the insect fails to get rid of its free water rapidly it succumbs to a higher temperature. The explanation offered for this is that where the fall in temperature is rapid, death is caused by the freezing of the free water in the insect tissues and that " bound " or " colloid " water does not freeze.

In dealing with physical methods I ought perhaps to mention reduced pressures. We know comparatively little about their effects and, except as an aid to fumigation, reduced pressures have so far been little studied as control measures.

Chemical control measures are generally described under the term " control by insecticides." Until recently the insecticides used in stored products were almost wholly vaporous or gaseous, or in other words fumigants. Of the action of fumigants on insects, in spite of much work done on *ad hoc* lines, we still have far too little knowledge. The most studied and the best understood fumigant in this respect is hydrogen cyanide, and from the work of Warburg, Keilin and others it is known that hydrogen cyanide acts by inhibiting the oxidation of the respiratory ferments or pigments. While scientifically this knowledge is very important we have still much to discover as to how hydrogen cyanide penetrates the insect tissues, and if we turn to other fumigants we have to confess that our knowledge of their biological action is almost negligible. Meanwhile, we are beginning to make a little headway in this field, and I think one of the most important advances is the suggestion, which may soon be confirmed by our own work, that the toxicity of a gas or vapour is directly proportional to the rate of

metabolism of the insect. Further, partly as a result of the work of Wigglesworth and partly as a result of the extension of his work in my own department, we have good reason to hope that a number of difficulties regarding the theory of the action of fumigants may soon be cleared up. Fumigants act through the respiratory system, and it is by a fuller study of insect respiration that new knowledge of the action of fumigants will be gained.

Of the use of insecticides other than fumigants I propose only to say that recently one of my staff, Dr. Potter, has devised a very simple insecticidal spray consisting of a white paraffin carrying an extract of pyrethrum, which has proved a most useful adjunct to fumigation.

Apart from the action of fumigants on the insects, we have to consider how the fumigant reaches the insects, and in this field I think my department may claim to have made substantial advances.

In the practice of fumigation it is generally assumed that when a gas or vapour is released in a chamber or warehouse the gas gradually disperses throughout the air space and the contained goods. The rate of its dispersal and its penetration into the goods is assumed to be fairly uniform, or to become fairly uniform within periods of six or twelve or twenty-four hours—the periods of exposure commonly given in fumigation practice. The extent or degree of distribution and penetration is commonly determined by the effects of the fumigant on insects placed in various parts of the chamber and in the contained goods. If the percentage of these "test insects" killed is high the distribution and penetration of the gas is considered to be good and effective. In estimating the amount of fumigant to be used in any given process some allowance is made for leakage and for adsorption and absorption of the gas by the walls of the chamber and by the goods. In general, however, and a recent circular on industrial fumigation against insects issued by the Bureau of Entomology of the U.S. Department of Agriculture bears this out, the allowances made for these factors affecting distribution, penetration, and insecticidal action have often no better basis than guesswork, and it is safe to say that they are nearly always wholly inadequate.

It is worth while to consider these factors affecting distribution, penetration and insecticidal action a little more closely. First, I think we may consider the value of the methods available for studying these factors. The most obvious method is to take samples of the air-gas mixture at various points in the air space and in the goods treated. These samples may be taken in two ways, by drawing off the air-gas mixture and aspirating it through suitable solutions or by drawing samples into a vacuum flask and then estimating the fumigant obtained. Of these two ways of sampling, the second as developed by Page and Lubatti in my department is in practice the more convenient and satisfactory. This method has been described by Page in the *Journal of the Society of Chemical Industry*, and need not be further described now.

The second obvious method of evaluating the effects of fumigation is to use "test" insects placed at various points. This is the method used in the United

States and advocated by the Bureau of Entomology there, and it is recommended almost to the exclusion of gas sampling. In our experience it has grave disadvantages. In the first place the action of fumigant gases and vapours on insects varies, as we have seen, probably with the rate of metabolism of the insect, and unless that has been determined beforehand and unless it is known that it will not change under the conditions of the fumigation, no value can be attached to the results obtained. The most simple proof of this I can give is that if two batches of hibernating caterpillars in their light silken cocoons are taken and if in one batch the caterpillars are removed from their cocoons and in the other they are not, those caterpillars which have not been disturbed will require, it may be as much as, a five times greater concentration of fumigant to kill them than those which have been disturbed. Moreover, in commercial fumigation it too often happens that insects are obtained at random without any knowledge of their physiological states, and such insects are worthless for test purposes.

In our work, therefore, we have employed both the vacuum flask sampling method and the test insect, using insects of known origin and history, and it is to this simple system that I attribute our advancement of knowledge. I need only sum up the main advances we have made. We have shown that allowance must be made for variation in the purity of the fumigant; that even distribution and penetration of the fumigant requires special attention—it is rarely attained except when special methods such as the use of vaporisers and of punkahs or fans are employed; that loss of active fumigant by adsorption and absorption is far greater than is commonly assumed, and that the quantities of gas so retained by the walls of chambers, or the fabric of buildings, and by the goods themselves is also higher than is generally accepted in practice. In fact, efficient fumigation is a highly technical process and requires constant supervision. This is not the occasion on which to discuss the scientific and technical problems of the adsorption and retention of gases by various products, but I should like to emphasise the enormous importance which the study of these problems has for the control of infestation of foodstuffs and other products by insects.

I may now turn to the more practical problems of insect control, and I think I can best illustrate them by referring to our work on the control of the infestation of dried fruits by the moths *Plodia interpunctella* and *Ephestia elutella*. While in the early stages of our work on stored products when we were still getting to know something of the identity and biology of the insects and something of the behaviour of fumigant gases, we were called on by the Australian Dried Fruits Board to attempt, on a commercial scale, the control of serious infestation of Australian dried fruits. For some years previously the Board had been making strong efforts to cope with this problem, and had in fact been using fumigation as the main means of control. Despite all their efforts conditions were getting worse.

The problem as we found it was that infested fruit arrived in London, was transferred from the ships to barges and in these brought up to the wharves, where

it was fumigated, and then transferred to the warehouses. If the fumigation had been successful all should have been well, but the fumigant used had grave defects which our earlier and apparently academic work soon showed. The fumigant was a mixed one and the mixture was unstable. It was, when badly mixed, a poor insecticide, and what was happening was that the barge fumigation was not efficient, and fruit still actively infested was going into the warehouses. From this fruit in the autumn the caterpillars wandered and settled in the warehouses and we were faced with two primary problems, first to ensure efficient barge fumigation and, second, to clean up the warehouses. The first problem proved relatively simple, but only after much hurried experimental work was done. We substituted the gas ethylene oxide for the mixed fumigant and, by devising a special vaporiser to ensure proper distribution of the gas, attained high efficiency.

The second problem proved much more difficult. A series of large scale experiments showed that, apart from many difficulties attendant on it, fumigation of the warehouses was impracticable because of its high cost—the warehouses ranged in capacity from 150,000 to 200,000 cubic feet. Meanwhile every crack and cranny in their fabric harboured caterpillars, and I admit that we almost despaired of dealing with that problem. In desperation, I suggested the use of a pyrethrum spray and, to cut a long story short, after much wearisome experimental work, we devised a new type of spray. We knew that it was hopeless to get any spray to penetrate every crack and cranny, and Dr. Potter resolved to tackle the moths as they emerged from these crevices. The moths have the habit—a fortunate one for us—of flying upwards as soon as their wings are dry and they also have the habit of coming out of their pupal skins in the evening. We therefore used a mist-like spray which hung about as a cloud, and by sending this up after eight o'clock in the evening we killed enormous numbers of the newly emerged moths. We found that when this misty spray settled it left an invisible film on any surface it touched, and caterpillars of all sizes died if they crawled on it. A full account of this spray and its use has been published by Dr. Potter, and I need only add that as a result of our and their combined efforts in efficient fumigation and effective spraying, the Australian Dried Fruits Board have for the last two seasons sold their fruit without a single complaint of infestation, and we ourselves find their warehouses so clean that we have abandoned them entirely as a source of insects for experimental work.

Apart from dried fruits infestation we have had considerable success in dealing with tobacco infestation, and I think we may say that we do now understand the main principles of infestation control applicable to conditions in this country.

May I say just a word about infestation and its control overseas? My view is that the main difficulty there is the lack of trained staff. I feel that although we may publish all our results, these will not be successfully applied unless trained staff is available. I am glad to say that in Canada Dr. Gibson, head of the Entomological Branch, contemplates the establishment of a stored products entomology section. I heard only a month ago from Dr. Sing Pruthi, Imperial

Entomologist in India, that a similar section is being formed, and in Australia the whole question of stored products infestation is receiving serious consideration, and already under the ægis of the Commonwealth Council of Science and Industry work on fumigation of fruits and in the use of our spray is being undertaken. I should like to think that our work is in part responsible for these developments.

Finally, may I add one word about the importance of this work. If ever we are faced with an international crisis leading to war, the storage of foodstuffs and other commodities will be a question of vital importance, and it is much to be hoped that it will before long receive the fuller recognition it deserves as a factor in Imperial defence.

DISCUSSION

THE CHAIRMAN, in opening the discussion, said : We are all extremely indebted to Professor Munro for his excellent lecture. I think it bears out what I suggested at the beginning, that thoroughness is the essence of all the work that he and his collaborators undertake ; studying not only the life and changes in the insect, but also investigating in detail the actions of fumigants, the diffusion of the gases, and their penetrative powers in different parts of the buildings treated. It is quite clearly a problem with many technical aspects, none of which can be ignored. Hit and miss methods are not good enough. The work which is being done at Slough merits the closest attention not only of scientists, but of all interested in trade in perishable commodities and of public health authorities.

MR. JOHN J. SCOULER (Australian Dried Fruits Board), said : We are very deeply indebted to Professor Munro and his team for the work they have done for us. A few years ago we had reached a stage when the successful marketing of our products, Australian dried fruits, was very seriously endangered by the infestation menace, and it was unfortunate that the fruits come to this country at a time favourable for the breeding of the pests. We tried to do something about it, but we only had a certain amount of knowledge based on American publications and work done by Dr. Myers in 1925. Professor Munro's team started their work seriously at the end of 1932, and the progressive results of that work can be seen by figures. For instance, in 1933 we had to spend some £5,000 on fumigating in warehouses in this country in order to deal with insect life and to ensure our fruit deliveries being in good order. In 1934 we spent about £3,000, and last year about £200, although the amount spent last year on actual re-fumigation was really only about £78.

In the last two years we have been able to deliver our goods without a single complaint, but our job is not finished as far as Professor Munro's work is concerned. Apart from the obvious problem of reducing costs, we are always working to increase efficiency. We are hoping to have his team working on our problems for a long time to come, as there is always something new to be done. For instance, Dr. Potter's spray is a wonderful thing. It can be used on our cases as many as twenty times in a season without any appreciable staining, but we should like to get rid of even that slight stain. The more you tackle these problems, the more you realise you can never stop.

We feel that there is much to be done throughout the country. We can deliver Australian fruits from our warehouses absolutely free from life, but they then go into other warehouses or tradesmen's stores which are troubled with infestation. The scope of this work should be extended right through the country.

Mr. T. Williams (Port of London Authority) said: The duty of a warehouse keeper as a custodian of foodstuffs is to take all possible care to see that, while the commodity is in his keeping, insect pests are not allowed to develop. After all, he is not responsible for the existence of these creatures; they are inherent in the commodity itself and are due to circumstances over which warehouse keepers, at least, have no control. I think that the feature of the problem which is now a matter of concern to the Port Authority is the effect of infestation in considering the construction of new buildings for warehousing goods. There is no doubt that the kind of building now used for the storage of general goods was constructed in an age when such things as insect infestation had never been thought of, and when the storage of importations of enormous quantities of food, liable to contain the larvæ of destroying insects, was not contemplated. Then, good old English oak and the now historic style of architecture with beams, wooden floors and the crevices naturally resulting, produced warehouses which were strong, airy and often beautiful. When, however, you put (say) a parcel of tobacco in a warehouse of this kind and you have no knowledge of the hidden life it contains you find that, in the summer evenings when your workers have departed, the grubs emerge, find a resting place in the cracks in your ceiling and floors, and have all the facilities for continuing their life cycle.

The Authority, as Professor Munro has said, have made a contribution each year to the work of his department in the hope that some physical and not too expensive method may be devised to limit the harm these creatures can do, but it is feared that until all the old-fashioned warehouses are done away with, and, in their place, there are erected gas-tight concrete warehouses with smooth walls and fan apparatus, etc., we shall not be able to control these pests completely. Possibly, too, we shall be vexed by other consequential problems arising out of the necessity for fumigation.

In acknowledgment to Professor Munro and his staff, it must be said that they have always been ready and willing to help the Authority at all times and, with their assistance, we have been able to do all that is physically possible to combat these pests. It is hoped, however, that proper support will be given to his work by a national recognition of the need for adequate scientific investigation into the question of the preservation of food products.

Sir Arthur W. Hill, K.C.M.G., F.R.S. (Director, Royal Botanic Gardens, Kew), said: In the first place I should like to refer to what Professor Munro has told us about the extraordinarily useful results of the work of the Empire Marketing Board. We have heard at various times of the value of some of the work initiated through the funds placed at the disposal of scientific workers and institutions by the Empire Marketing Board, and you will, I feel sure, agree that this work started by Professor Munro from the funds of the Board has yielded most valuable results. I hope that some such body as the Empire Marketing Board may be revived in order that work of this kind, which is of Imperial importance, may be carried on and developed. There are many problems still demanding investigation in order that the troubles due to insect attacks may be fully solved. The losses are so great and the importance from the food point of view so vital that it is clearly work deserving of all the support it may need.

I was interested in hearing about the Australian fruit, because not very long ago I paid a visit to one of our largest chocolate manufacturing works where they use a great number of raisins, and I asked if they obtained their raisins from Imperial sources. They said they would not touch Australian raisins because of their condition, and were getting them from Greece or Crete. Now there is no reason why,

from what Professor Munro has told us, they should not get their fruit from Australia.

What is so interesting in this work are the curious side issues that have to be followed. It is not only a straightforward fumigating of a boat or a warehouse, but you must find out the life histories and habits of these harmful insects, and it largely depends on the many odd facts you discover as to whether you are going to be successful or not. Much depends on the penetrative power of your gases or on degrees of temperature. I came across a parallel case a few years ago. A market gardener who grew lettuces and cabbages in the Heston district held rather strict religious principles, and objected to his employees cutting the vegetables on a Sunday for Monday's market. The vegetables as you know are closely packed in box crates and taken up to Covent Garden. He consulted a cold storage engineer about the problem, who was an expert on the erection of cold storage plant for meat, and was advised to erect a cold storage chamber, which he did. The crates of cabbages were run in on Saturday evening, and the temperature was run down to about freezing point. Next morning the temperature in the storage was something like 60 degrees, although the chilling apparatus was working properly. The engineer came to us and asked what was the matter. I was very interested, as it was a most instructive demonstration on a commercial scale of the generation of heat by respiration. The cabbages of course were still alive and breathing, and giving off heat in consequence, and by being packed close together their effect was cumulative, and accordingly up went the temperature. The engineer was astonished to hear that the cabbages and lettuces were still alive after they had been cut from their stalks! Of course they were. I went down to see the place, and in the cold storage where a few cases of cabbages had been placed the temperature registered just about freezing point, but when I put thermometers inside the boxes among the cabbages the temperature was about 70 degrees. It is problems of this nature, often unexpected, which Professor Munro has to tackle in bringing his work to such successful issues.

Mr. W. G. Freeman, B.Sc., said: I have listened with great pleasure to the remarks of Professor Munro, and one cannot help feeling that the question of storing products of this nature and their insect infestation has been one of the most fundamental problems of man. We know that in the remote past primitive man, if he wanted to live at all, had to find a store for food, and he had no scientists to advise him. The early peoples who found means of storing food were the people who developed, and in a way civilisation is based on being able to store food.

The work at Slough is very important because, in these days when we must carry things about from one part of the world to another, perhaps our present civilisation is going to be more dependent on Professor Munro's work than it has been in the past.

One would of course like to have some more hope of the intermediate stages of infestation being cleared up, for instance with the cocoa moth. It is difficult for pressure to be put on the planter or the warehouse people in the country. If there is infestation on board ship or in the warehouses everybody passes the blame on to someone else. If the Port of London Authority cannot put up new warehouses, the question should be gone into during the intermediate stages.

Mr. A. Moore Hogarth said: Two things occur to me: what is the relative toxicity of ethylene gas to cyanide gas, and how were the barges degassed when the hatches were opened? Secondly, I have had some considerable experience with vermin over a quarter of a century, and one thing which came before my notice when I was at the Ministry of Food was the fact that while people like Professor Munro are

waging war on various pests, the general trader, or the small man, found it extremely difficult to obtain help, which was, shall I say, honest. I speak of people who used these gases. I found when I had several of these people before me that they always felt that it was part of their job that they should, at all events, leave if possible one pregnant female to perpetuate the species so that their job would not be finished. I suggested, as a check, the institution of some type of examination and the issue of a diploma to reputable people engaged on that kind of work. I understood at the time that the Ministry was going to approach London University to see whether it were possible to bring about some collaboration, or some kind of co-ordination by which these people—even the common or garden rat-catcher—could be subjected to a form of examination in some way which would enable the person who employed him to make sure that he was getting honest service for his money, and that breeders were not being put back to circumvent total extermination.

MR. R. V. WADSWORTH, A.I.C., said: I have listened with interest to all that Professor Munro has told us of the good work which he is doing in attacking the problem of insect infestation.

I am a little surprised to find that even to-day so great an emphasis is laid on fumigation. I have no doubt that occasions do arise when the entomologist finds it necessary to call in the chemist to fight an epidemic, but in essence the problem is one for the entomologist. I have no doubt that Professor Munro, as an entomologist, can provide us with some methods of preventive biological control. This, surely, is the correct way of fighting storage pests. I find it difficult to conceive of a person who would not be shocked at the idea that we destroy the insect in our food, leaving behind the dead insect and the residue of its feeding. After all, fumigation is only of use when an attack is present—it offers no protection to the goods afterwards.

I agree with Professor Munro that the control by parasites of stored products pests has no future. As a method it is an exact parallel to fumigation.

I know that in some cases simple and natural methods are effective against insects. As an instance, I might mention that if you went into the bonded stores of one of the largest cocoa and chocolate manufacturers in the world, you would be hard put to to find a single moth on the cocoa which is purchased by their own buyers on the West Coast of Africa. The reason for the absence of insects is simple. The cocoa beans, when first purchased, are generally spread out in the tropical sun, at a temperature well above the lethal temperature for *Ephestia*, and any infection which may be present is destroyed at birth. The beans are placed in new sacks in well-kept stores, and shipped at an early date. They are put in warehouses under strict supervision until required. Such methods must appeal to all who are concerned with the cleanliness and purity of their products.

It is preventive biological control by natural methods which we really need, and I am sure the entomologist could provide us with it.

DR. F. P. COYNE said: A point about grain. In Germany they have been doing more work on this question than we have in this country, and one of the results is that they have provided a subsidy for merchants towards the cost of fumigation. As a result over 200 grain silos are permanently fitted for fumigation. I think in this country there is not one silo fitted for this purpose.

THE LECTURER, in reply, said: The toxicity of ethylene oxide relative to hydrogen cyanide is about one-third.

The question of professional fumigators is one which has long been requiring attention. My own opinion is that all fumigators should be registered, and should possess certain minimum qualifications, and it is just possible that some regulation may be drawn up to that end in the near future when the need for it is more fully seen.

The question regarding prevention rather than cure is a very difficult one. I have frequently stated, and published, the opinion that the cheaper and the more efficient fumigation becomes, the less likelihood there is of the commercial man taking measures of prevention, and for that reason one deplores the fact that fumigation methods must be used. We are very much in the position of the medical man ; we must apply first-aid until we get preventive methods, and the scientist must, while the present apathy in industry persists, do something practical first. The Ministry of Health takes the view that fumigation is to be deplored as a necessary evil.

As regards cocoa, after we had called attention to the state in which cocoa arrives in this country, the matter was taken out of our hands. We have not had a penny subsidy from the cocoa trade for our work, although our results are being used and fumigation of cocoa is practised. The explanation of the fact that you can buy cocoa which is clean is simply that if you pay a big price you can get clean cocoa, but the price of the lower grades of cocoa will not admit of preventive measures being taken.

I believe myself that the ultimate aim of the economic entomologist is one of prevention rather than cure, but I am convinced that until we get much more support for what is called pure entomology we are not likely to find out the kind of knowledge we have got to get before prevention is possible. Economic entomologists are not in love with temporary palliative measures ; we dislike them more than anyone else, because we know how far short they are of our aims, but we are not likely to get funds until we get some practical results in control. Now we have got them it is to be hoped funds may be forthcoming for the research absolutely necessary as a basis for preventive work.

A hearty vote of thanks having been accorded to the lecturer, the meeting terminated.

NOTES ON BOOKS

Batsford's Pictorial Guides. No. 1, Amsterdam ; No. 2, Copenhagen ; No. 3, Stockholm. Photographed by Geoffrey Gilbert. London : B. T. Batsford Ltd. 2*s*. 6*d*. each.

There is no doubt about it : Mr. Gilbert is an excellent photographer. His pictures are not only of the brick, stone and concrete that the cities he depicts are made of, but of the people, the water, the birds, the sunshine and shadows that inhabit them as well.

These books give English readers a feeling of envy for the old and not too large cities of the north, where it has been found possible to preserve so much usefully, and add so much suitably. To be sure, the entire populations of Denmark and Sweden do not exceed the numbers living in the London district ; but many of our small handsome cities have been made, unnecessarily, to suffer indignities which Copenhagen and Stockholm have been spared.

Both these capitals, and Amsterdam too, owe a good deal to their situation. Copenhagen, with its beech-woods, is a maritime city in a way it is impossible for most Londoners to feel that London is. Stockholm, too, lies round expanses of water,

and very handsome are such building schemes as these on the Norr Malarstrand which cast their reflections in salt water. The map of Amsterdam inside the cover shows very well what Mr. Gilbert means when he compares the plan of the city to an oyster. The outermost accretions of the oyster's shell, lines of working-class flats, do not obtrude on the old Germanic Venice within. It is curious, certainly, that in a city where so much traffic is water-borne tax should be paid on 100,000 more bicycles than there are people in the whole place. " It may be," says Mr. Gilbert, " that some people have special machines to go with their Sunday clothes." In only two of the Amsterdam pictures is a motor-car to be seen.

Perhaps the most remarkable modern building in the three picture books is the Grundtvig Cathedral in Copenhagen with its great organ-like facade. This is a city of wonderfully homely old corners. It is the biggest of the northern capitals, yet it reflects the individualistic character of a small industrious nation. " Charm is in the little," said the Greeks.

Mr. Gilbert having found his vocation, and Messrs. Batsford having found Mr. Gilbert, we look forward to a great many more of these little books.

P.S.—We have now received the fourth book of the series, which is on Hamburg. There is no falling off in Mr. Gilbert's account of this, the world's third greatest port. This is also a city of many waters ; but here the old quarters do not enjoy quite the esteem they get where trade is less fast and furious. We have several photographs of the pretty blonde German children. But how is it that German horses have such a non-Nordic profile ?

VICTORIA AND ALBERT MUSEUM : ANNUAL REVIEW. 1935.

Among the sculptures acquired this year by the Victoria and Albert Museum is an early fourteenth century carved slab from the site of the Bank of England—city sites are often rewarding to the archæologist. The bust of Henry VII, probably by Torrigiano, is important for its likeness of this remarkable king, and a fine piece of work. Zumbo's wax Nativity group is an example of a technique of which nothing but nonsense could be made nowadays. Last, and collectively most valuable, are the sculptures in the Eumorfopoulos Collection. Several of these are illustrated in the *Review*, including the jade horse's head and the sixth century sandstone Bodhisattva.

In the department of ceramics the Eumorfopoulos Collection is obviously the chief acquisition, while the most important Continental addition to the museum is a fine Meissen porcelain service decorated with *chinoiseries* by Lowenfinck. The department of engraving has been enriched with ninety lithographs by Henri Matisse ; these are to be exhibited this year before being relegated to the students' room. Among a large number of new paintings is an interesting David Wilson—a piece of fluent naturalism by this great exponent of the picturesque.

The Heneage (Armada) jewel, a locket of enamelled gold, set with diamonds and rubies, has been presented to the museum by Lord Wakefield through the N.A.C.F. Three fine Peruvian carpets have been acquired by the textiles section ; and a rug from Oltenia and another from Besserabia have been given by Roumanian friends of the museum. The department of woodwork has received " an unusual number of important additions," how superb some of them are the illustrations plainly show. The India Museum has been graciously presented with a brass box from Jaipur by Her Majesty Queen Mary, and the Ampthill bronzes have now been added to the permanent collections as a bequest from the late Lord Ampthill.

P. B.

JOURNAL OF THE ROYAL SOCIETY OF ARTS

No. 4368 *FRIDAY, AUGUST 7th, 1936* VOL. LXXXIV

All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

DOMINIONS AND COLONIES SECTION COMMITTEE

A meeting of the Dominions and Colonies Section Committee was held recently for the purpose of drawing up the programme of papers to be read during the session 1936–37.

The Committee consists of the following members :—

Major Sir Humphrey Leggett, R.E., D.S.O. (Chairman).
Colonel Sir Henry McMahon, G.C.M.G., G.C.V.O., K.C.I.E., C.S.I. (Chairman of Council).
Viscount Bledisloe, P.C., G.C.M.G., K.B.E.
Sir Stephen M. Burrows, C.I.E.
Sir Alan Cobham, K.B.E.
Colonel H. L. Crosthwait, C.I.E.
Sir Edward Davson, Bt., K.C.M.G.
Mr. W. G. Freeman, B.Sc.
Lieut.-General Sir William Furse, K.C.B., D.S.O.
Sir Arthur W. Hill, K.C.M.G., F.R.S.
Sir Harry A. F. Lindsay, K.C.I.E., C.B.E.
Lord Lugard, P.C., G.C.M.G., C.B., D.S.O.
Mr. R. Nicholson, C.M.G.
Mr. Charles Ponsonby.
Brigadier Sir Edward A. Tandy.
Sir George J. F. Tomlinson, K.C.M.G., C.B.E.
Major-General C. M. Wagstaff, C.B., C.M.G., C.I.E., D.S.O.
Sir Archibald Weigall, K.C.M.G.
Mr. A. Wigglesworth.
Lieut.-Colonel Sir Arnold Wilson, K.C.I.E., C.S.I., D.S.O., M.P.

PROCEEDINGS OF THE SOCIETY

TWENTY-THIRD ORDINARY MEETING

WEDNESDAY, 20TH MAY, 1936

THE RIGHT HON. VISCOUNT ULLSWATER, P.C., G.C.B., in the Chair

THE CHAIRMAN, in introducing the lecturer, said: The name of the lecturer is one very well known to any who have an interest in cotemporary art. I suppose there is no man now living who has painted so many portraits of the distinguished men and of the beautiful women of this era. It would be difficult to find any crowned head, or any distinguished statesman or personality, whom Mr. de Laszlo has not painted. From His Holiness the Pope down to the latest king, the King of Greece, all are included in his gallery. A collection of his portraits would be of the greatest possible value to the historian of the present day, and they would be a marvellous tribute to the indefatigable industry which Mr. de Laszlo shows.

The following paper was then read :—

THE ART OF OUR DAY

By PHILIP A. DE LASZLO, M.V.O.

May I begin by saying how greatly I appreciate the opportunity that has been given to me to speak to you to-night about the art of our day.

In any examination of the history of art one of the first things to appear is that from time immemorial there has been between religion and art the most intimate alliance. Always the exponents of religious beliefs have sought the assistance of the artist as an interpreter who could visualize the principles of the creed which was being presented and make visible the mental images which the teacher was suggesting by means of words. But the artist, enlisted in this way in the service of religion, was required to make his work worthy of the mission which it was to fulfil. The best was expected of him and there had to be, in all that he attempted, a real spirit of reverence. It was recognized that, while he was the servant of religion, he was also its ally, and that his standard of performance must be as sincere and as earnest in its pursuit of perfection as that of the most devout believer in the creed which they both were striving to advance.

And, it must be said that in all the past civilizations of which we have knowledge to-day the artistic achievement which had as its purpose the glorification of religion has been of the highest rank, and has shown the spirit of the artist under its most convincing aspect. Look where you will—in China, India, Egypt, Assyria, Mexico, Greece or Rome—and at what you will—at the bas-reliefs of Assyria, the temples of Egypt or the art treasures of the Vatican—and you will find in them all a seriousness of intention and a loftiness of effort which are exceedingly significant. Certainly, it was the same devotion to a noble ideal that inspired the monumental work of

Michelangelo in the Sistine Chapel, and the Parthenon, that magnificent achievement of Phidias. Both of them were giving of their best, because they held that only by the generous gift of what they felt to be their best, could they keep faith with the divinity in whom they believed.

Michelangelo, on his death-bed, said to his great friend Cardinal Salviati, " Two things I regret : firstly, that I have not done more for the well-being of my soul ; and, secondly, that I must die while in my art I am still only learning to grasp the A B C ."

This desire to reach the highest has been, I repeat, the source of that vitality and that spiritual energy which have kept unbroken the continuity of art among all the changes that civilization has undergone. Just as in the ancient Pagan world it had power to stimulate the æsthetic activities of which so many evidences remain to-day, so on the advent of Christianity it became one of the chief means by which the realities of the Christian faith were made clear.

I do not think that I am claiming too much when I say that to this association of art with religion through many thousands of years we owe that absorbing search after perfection which is the supreme influence in the life of every true artist. From a vast array of predecessors, masters of their various crafts, there has been handed down to us a tradition whose authority is not lessened by the fact that its origin is lost in the mists of antiquity. We cannot depart from it now without sacrificing the essential qualities of art and, if it is divorced from this tradition, art is stripped of its principles and reduced to a purposeless sham. For, after all, what is the purpose that art fulfils in human life ? Surely, to foster a desire for the best and to show how to find in nature the beauty that will satisfy this desire. I am a painter and, as a painter, I believe that my supreme duty is to worship nature and to realize her truths as faithfully as I can. I say--with Keats—" Beauty is Truth, Truth Beauty : that is all ye know on earth and all ye need to know." I am anxious you should appreciate the full significance of this because I propose to speak very plainly about what is happening in these days to affect the spirit in which artists work.

We are living to-day in a material age, in times when mass production leaves no opportunity for the exercise of that individuality of effort which is one of the essentials of real artistic achievement. We restless moderns have no use for sentiment, and in the hurry and rush of our daily existence there is no moment allowed to us for contemplation or quiet thought. We are dominated by a craving for sensation and our whole outlook on life is ugly and distorted.

Is this striving after perfection for the glory of attaining it ? Is this sordid materialism the spirit an artist should bring to his work ? How would it be possible for him to claim that he is the worthy heir to a great tradition if, after the modern manner, he is mainly studying how to evade responsibilities and how to escape from discipline and restraint ? And how can he hope to create the perfect work that is required of him if, to attain material success, he drags his accomplishment down to the level at which it will satisfy a debased popular taste ?

Now, I am asking you to consider these questions because I am convinced that

the answer to them is to be found in the condition of the arts to-day. I say intentionally " the arts," as I feel that they all show symptoms of the same disease; but for the purposes of my argument it will be sufficient if I limit myself to the art of painting, which is my particular concern. Look, I beg you, at the paintings which are to be seen in present-day exhibitions and tell me in how many of them you can discover evidences of earnest intention. Take your minds back to the art of those periods long past to which I just now referred—how much of its sense of serious responsibility survives in the works of what is called our modern school of painting?

I am much afraid that, in describing the majority of the productions of that school, honest comment would necessarily become exceedingly plain speaking. We should have to fall back upon such phrases as are used by the eminent French writer, Camille Mauclair, in some of his articles on our contemporary art. He declares that he finds in it " hatred of nature and of beauty," " a passion for ugliness for its own sake," and " an aggressive barbarism which transforms the human body into a scarecrow and nature into a nightmare " ; and unhappily we often should have to agree that he is right when he dismisses so many of the artists of the modern school as " apostles of deformity, and negro-lovers."

Frankly, I do not think that in what has come down to us from past civilizations you would be able to point out anything which would fairly be open to such attacks as these. Of course, you would find examples of primitive work, but they would be honest in intention and free from affectation. You would, here and there, come across quaint caricatures of natural facts, but that the motive in them was definitely humorous could not be mistaken. Also, you would see, often enough, natural forms conventionalized and reduced to a formal pattern, but these would be arranged deliberately to fulfil a clear decorative purpose. To say that in any of these there was a passion for ugliness or an intentionally aggressive barbarism would be untrue. Hatred of nature and beauty would be the last thing of which the artists responsible for such works could be accused.

No! With a feeling of distress I say it—now, at the end of the many thousands of years through which civilization has progressed, the degradation of art has been reserved for our time.

Yet, after all, if the great mass of ordinary men can be reproached for being ignorant and lacking in taste, is it really their fault? May it not be that for their deficiencies they are more to be pitied than blamed? Are they being given a fair chance? In bygone days the artists, by keeping their work consistently at the highest standard to which they could reach, showed the public what artistic effort could achieve, and accustomed the ordinary man to expect the best. Unconsciously he was being educated and helped to appreciation of the greater qualities in art.

But who is to reach him now? The artists are shirking their responsibilities and following where they ought to lead—offering to the public the trivial and ridiculous stuff which they think it wants and seeking to take advantage of its ignorance. Who can take their place? The writers on art? How many of them are capable of educating even the most willing learner and how many are genuine exponents of

honest artistic principles? In far too much of what is being written about art to-day, I see nothing but ill-considered and inconsistent advocacy of wild theories, and even more intemperate adulation of erratic departures from æsthetic sanity.

One of the absurdities of modern criticism is the argument, which you will find put forth even in the most prominent newspapers, that the representation of nature is not art, and that a man is only to be counted as an artist when he evolves something from his inner consciousness, without reference to, or dependence upon

ABOUT 8,000 YEARS OLD. CAVE PAINTING IN COLOUR

nature. The less evidence of nature study there is in a piece of work, and the greater reliance it shows upon a morbid or ridiculous convention, the more artistic is it pronounced to be. In other words, art has to turn its back on nature; and the crazy fancies of unbalanced men are to be substituted for the inspired interpretation of natural truths which is given us by the observant artist who can show clearly how he responds to the impressions which nature makes upon him.

This argument, I repeat, is absurd, because art from its earliest beginnings has concerned itself primarily with the representation of nature. Art and nature are linked together by a bond which cannot be broken. It follows that the people who have no belief in nature as a teacher and guide are going after something which is

not art at all and they must find some other name for the devices by which they pretend to express themselves.

What then is to be done to re-establish the authority of true artistic tradition ? I cannot believe that art, with all the splendour of its long record, is destined now to sink into decay. Its state was better even in the Stone Age, when the cave man

FROM THE PARTHENON, ATHENS

drew, upon the rocks that sheltered him, pictorial impressions of the world he knew. A savage he may have been, but he was by instinct a sincere student of realities, and in dealing with them he did his best. We want to recapture his spirit, for it was the one by which all real effort has been directed ever since. The artist must begin by amending his ideas about the way in which he can legitimately express himself. It will do him good to go back to the cave man for some much-needed lessons in sincerity and simple directness of vision, but when he has learned these lessons he must look, for guidance in the way to apply them, to those master-craftsmen who

have established the standard of technical achievement through the successive epochs of art history

The craft of painting has to be learned again to-day, because too many of our present art workers have forgotten that perfection of handiwork is unquestionably one of the greater essentials in all artistic practice and that, without it, the artist

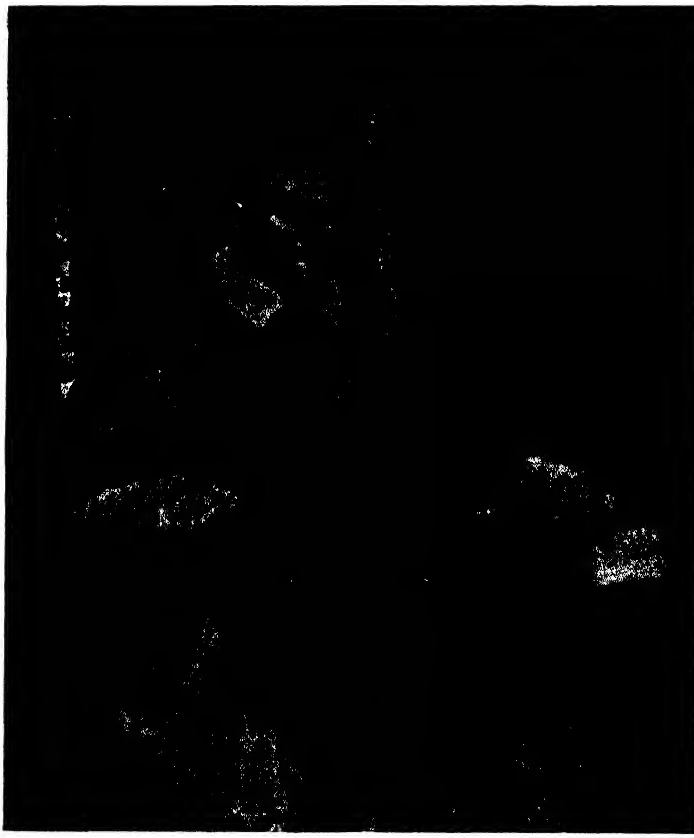
WORK OF A LEADING MODERN EUROPEAN SCULPTOR

can never properly explain himself or make the meaning of his work reasonably clear This was well put by Mr Frank Rutter, the able art critic, in a recent article, when he wrote, " we can all agree that the best intentions will not redeem a picture that is pitifully poor in technical merit "

One of the symptoms of the aggressive barbarism of which Camille Mauclair complains is the wilful neglect of technical quality which is seen in so many of the modern works of art The men who produce them no longer care to draw correctly, or to paint with any grace of handling , they do not study how to manage their

materials ; they make no attempt to observe subtleties of colour and tone relation, and they have adopted a slovenliness of manner and method which is lamentable. Hence the feeling of repulsion which present-day paintings only too often excite.

The artists, as I have just said, should begin by setting their own house in order. But as soon as they have proved that they are genuinely anxious to reform, they have,

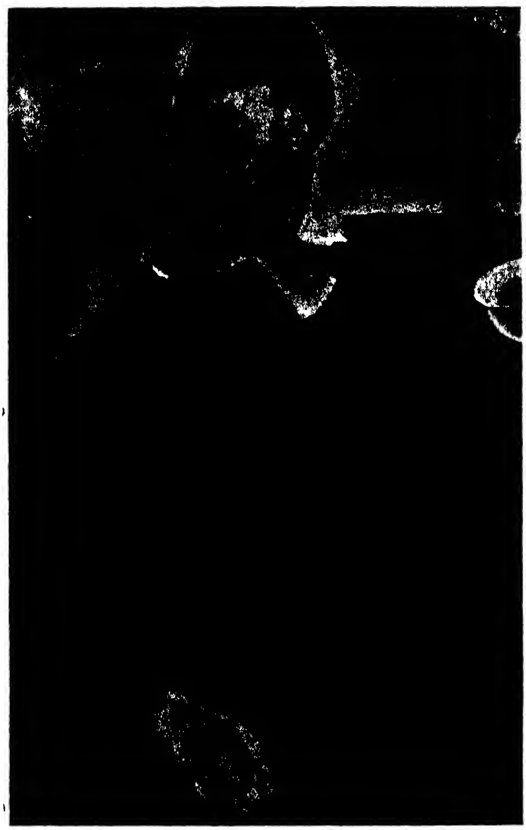


Portrait of Pope Innocent X—by Velasquez

I think, a right to expect that the intelligent layman will take his share in the educating of the wider public. But, of course, if he is to make the right use of the opportunity offered to him, he must be in sympathetic agreement with the principle that the chief article in the artist's creed is the seeking for perfection. In other words, he must acquire full power to discriminate between the men who deserve encouragement in their struggle to excel, and the pretenders whose earnestness is only a pose.

In the intellectual life of any civilized community art is one of the most powerful

influences, and it is enormously important that this influence should be rightly directed. But now that the signpost which formerly pointed this direction has been thrown down, the people who depended upon it to keep them on the right track are left without guidance and have gone astray. So, if the intelligent men are not interested in art; if they, the leaders of public opinion, do not think it worth

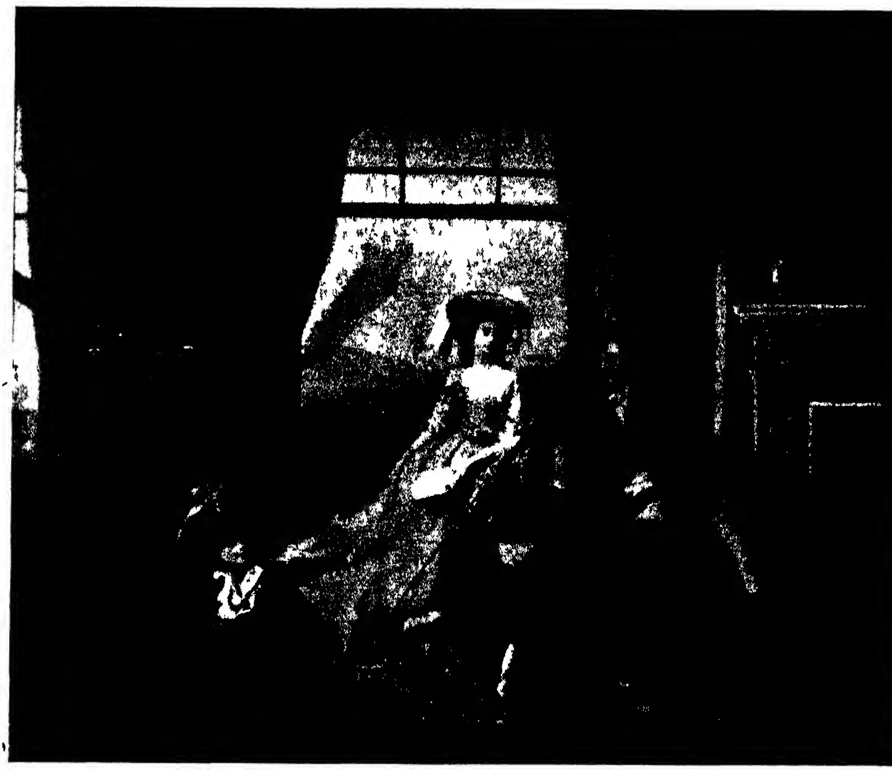


WORK OF A LEADING MODERN EUROPEAN PAINTER

studying or understanding, can you be surprised if it falls into evil ways and if the painters—who have to make a living somehow—plunge into wild experiments in the hope that they will attract attention. So many modern works convey nothing to the uninitiated, and art which requires verbal explanation has failed in its purpose.

Now, I want to explain why, as a painter, I believe so strongly in the worship of nature. When did the art of painting have its beginning? I presume that the cave man, whom I mentioned just now, can be accepted as the founder of the painter's art. At any rate he was, as far as we know, the first human being to make pictures

and to represent in them the things he saw. He must have had both the faculty of observation and the power to memorize what he observed ; and he developed a quite considerable degree of technical skill. To speak of him as a sincere student is fair enough ; he obviously did study, or his memory would not have served him so well ; and that he was sincere it is impossible to question, when we note the way in which he strove to realize what seemed to him to be essential facts. Really, the gap



THE SITWELL FAMILY—BY JOHN S. COPLEY

between him and the greater masters in art history is not so wide as one might think. Their intentions were much the same as his ; it was in the greater skill with which they expressed themselves that their advance from his stage of development was mainly shown.

In this advance we can trace the evolution of the art of painting. It began with a plain statement of something seen and remembered. As it went on, this statement was embroidered and amplified, details were added to it, and imagination entered in. But this fuller elaboration did not induce in the masters any lessened respect for the authority of nature as a guide and teacher ; rather did it make them more earnest

and devout in their worship. So, you will see why, as a painter striving constantly for the completeness that I hope to attain, I remain a devoted lover of nature. But do not misunderstand me when I say this. I am not implying that I must confine myself to slavish and mechanical copying of the subject before me, or that I must never arrive at anything more than a piece of literal realism. What I do contend is that I must have a close and intimate understanding of the mysteries of nature,

WORK OF A LEADING MODERN EUROPEAN PAINTER

because, until I have gained that, I cannot hope to translate correctly into the terms of imaginative art the beauties she reveals to me.

Let me illustrate this by an example. Take that supreme British master, Turner. His early studies were plainly the efforts of a man who was trying earnestly to accumulate experience and to secure a full control over the practical details of the painter's craft. By producing a long series of such studies, he made himself a master of executive processes and then, on this safe foundation of assured craftsmanship and exhaustive knowledge, he proceeded to build up that marvellous achievement, as a poetic and imaginative artist, which gave him his unique position

in the world of art. Yet he kept his cave man sincerity throughout, and his fidelity to nature as the source of his inspiration never changed or weakened. What his prolonged research had taught him was how to grasp the essential meaning of the subjects she presented and to depict that, rather than their merely superficial aspect. So, armed as he was, with superlative skill, he had the confidence to attack the most exacting pictorial undertakings and the ability to express the actual spirit by which nature was moved in the infinite variety of her manifestations. It was by this combination that he was able to reach the ideal truths.

Turner has shown us to what heights, beyond the reach of lesser men, the art of painting can be raised; his example of sedulous effort is one, however, that any serious artist is able to follow. In these days of revolution especially, it ought to be studied not only by the apostles of deformity, but also by those saner workers whose minds have not been perverted by false doctrines, but who need to be reminded of the duty which they owe to art, and to themselves.

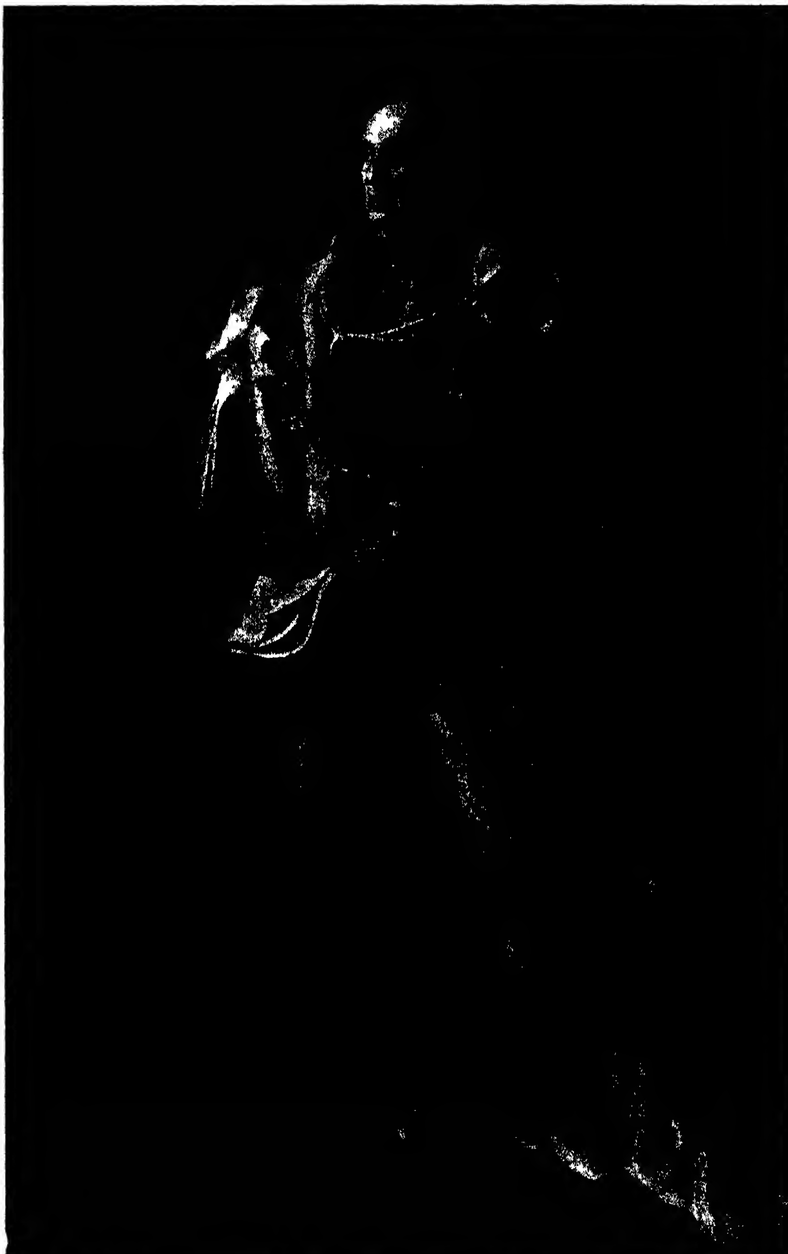
There are, for instance, painters, well-intentioned enough, who approach their subjects with a preconceived idea of how these subjects should look. They have in their minds a pattern to which nature must be made to conform, and they try to show in their work not her essential beauty but the conventionalized version of her which suits their particular fancy.

There are, again, others who take too casual a view of their responsibilities; who seem to be under the impression that the supreme and final achievement of a Turner or a Velasquez—the eloquent expression of the artist's whole personality—can be reached without the aid of that solid foundation of perfect craftsmanship which those masters laid with such infinite care, and to which their work owes no small part of its power to appeal.

That the slackness and irresponsibility with which the world is pervaded to-day should have produced artists of this type—not exactly bad, but sadly weak—is not surprising, but, definitely, the habit they have of resorting to mechanical devices, like photography, to cover up defects in their training, cannot be excused. Such departures from the true line of development affect harmfully the art of painting and limit the scope of the artist's practice.

Especially are they out of place in portrait painting, where a successful result depends far more than people generally appreciate upon the painter's intuition and observation, and his ability to control the mechanism of his craft. He must be able to respond actively to the most diverse visual impressions and he must have an equally lively capacity to solve the widest diversity of technical problems. If his outlook is conventional and his handiwork unskilled, it is impossible for him to produce a great portrait.

What then, you probably want to ask, is it that makes a portrait great? It is not, I may say, the merely exact reproduction of the sitter's face as it is seen by the artist in his studio—that is the kind of superficial likeness that a camera would give. It is a representation on canvas of the features of the sitter, but through the knowledge and intuition of the artist, there must be revealed in these features the sitter's soul



THE RIGHT HON. THE MARQUESS OF READING, P.C., AS VICEROY OF INDIA
—BY DE LASZLO

and all his potentialities of character and temperament. The picture must show us the spirit by which the human form is vitalized; and, besides, it must provide the sitter with the surroundings and atmosphere which are suitable to his personality and consistent with his state of life.

But, as it is only what the artist can see in his sitter that will appear in the portrait, the extent of this revelation will depend upon the degree of sensitiveness in perception which the artist possesses. Nothing will serve so well to give him the necessary insight as confidence and sympathy between him and his sitter. The truly great portrait is the one in which this contact has been so close that it has spurred the artist to his highest achievement and to which, by a tacit collaboration, the sitter and the artist have both contributed something vital.

May I instance some portraits in which I feel that this combination is convincingly illustrated? There is the magnificent "Nelly O'Brien" by Reynolds, in the Wallace Collection. There are Gainsborough's graceful "Morning Walk," Van Dyck's "Earl of Strafford," the portrait by Frans Hals of a man and his wife, Raeburn's "The Macnab," and those superb paintings by Velasquez, "Pope Innocent X," at Rome, and the head of Philip IV, in our National Gallery; and with these I rank some pictures that belong to our times—Sargent's "Mr. Marquand," Orpen's "Judge Moloney," Holl's "Lord Overstone."

These are conspicuous examples, but, of course, you can find many more by masters of all periods which satisfy the most exacting demand. It is not because there is any lack of great portraits to study, that artists to-day so often fail to do themselves credit.

If, then, in the art of to-day there are signs of decadence, what is the prospect for the future? I, at least, hope that history is going to repeat itself. Look back at what happened in this country when the Pre-Raphaelite movement woke art out of the sleeping sickness into which it had lapsed; remember the revival which came in France after the fall of the second Empire, and the reaction that took place there against the illustrative art and neglect of fidelity to nature which had previously been in fashion. What our Pre-Raphaelites and the French impressionists, led by Manet and Monet, really undertook, was not the starting of a revolution to make a new art world, but the revival of the spirit by which such great realists as Velasquez, Hals, Chardin, Hogarth, Titian, Goya, Raeburn and Reynolds were consistently guided. When Manet broke away from the conventions of his time, it was to observe and record the real colours and tone values of nature. What the British and French reformers desired was to find better ways of expressing the ancient and immutable truths—the truths themselves they did not question.

But these reformers, with their sane outlook and temperate methods, were succeeded by a host of cranks and mountebanks, each one of them trying to go one better than the rest in the promotion of strange perversions and extravagant "isms," and each one claiming to have discovered something by which the whole

aspect of art would be changed. This competition has led them at last, by successive downward stages, to the lowest.

So now the time is ripe for another revival and even now signs of its approach can be perceived. Students, I am glad to say, are beginning once more to appreciate the value of thoroughness and to interest themselves in qualities of draughtsmanship and technical expression, and in the work that some of them are doing now there is hopeful evidence of the growth of a sounder and healthier spirit than our art has known for a long while past.

And now may I ask you to be patient for a few minutes more, so that I can show you on the screen how the art of to-day compares with that which has come to us from the great masters of the past. The pictures I have chosen will speak more eloquently than any words could do, and will enable you to judge for yourselves by which spirit you would prefer the art of the future to be influenced and inspired.

DISCUSSION

The Chairman, in opening the discussion, said : We are all very grateful to Mr. de Laszlo not only for his interesting lecture, which will provoke thought when we compare classical and modern art, but also for the pictures he has shown, and not least for his own portrait of Lord Reading.

It seems to me there are certain conditions which should be observed in painting a portrait. First of all you have got to portray your sitter, that is to say, you must produce a likeness of him which people who have seen the sitter will at once recognise. If you cannot do that it is not a portrait ; it may be a picture, but not a portrait. Then the artist must be careful not to caricature. I have seen some admirable portraits during the last few years in the Academy, many of them of friends of mine, from which I turned away because I thought they were caricatures. It is a very easy thing to caricature, and not so easy to represent the sitter in his habit as he lived. One of the conditions which I think also necessary in a portrait is that there should not be arrested action. There should be repose. After all, the picture will probably be looked at for many years. Generations to come will look at it, and arrested action always leads the spectators to a sense of fidget and uncertainty as to when the action is going to be completed. A man who is just raising a glass to his lips, for example, is annoying, and fidgets. I begin to think, how long will it be before he drinks that cup of tea or glass of wine ?

I think, too, that most artists represent their sitters without sufficient consideration as to the place in which the portrait is eventually to be hung. An artist should be told before he begins to paint a picture where the light is coming from, either from the right or the left, and so on, so that he may make his picture to fit its future home. One other thing which I think is very necessary for the making of a great picture is to ascertain whether the picture is going to fill a place in the home of the family or to occupy a position in some official residence. In the former case you would naturally paint the sitter in the costume which he would generally wear at home. You would not represent him dressed up as a general or an admiral, because he does not in his home go about in that dress—except perhaps in Hollywood, where these things are expected. If, on the other hand, the picture is going into the official residence of a former viceroy, for example, you would naturally wish him to be represented in the uniform which he would have worn on certain great official occasions with which he was connected.

During the course of his lecture Mr. de Laszlo pointed out that one of the necessities in painting a portrait is that you should give not only a likeness, and a pleasant one, of the sitter, but that you should also express his character in his face. That I think must be the most difficult task of all, because a man does not always show his character in his face. You must read the *Dictionary of National Biography* or *Who's Who*, or be well acquainted with the sitter, to find out exactly what the character of the man is. It would be difficult to represent the face of a man who does not show at all the particular traits in his character which are known to a certain number of his intimates.

I am invited occasionally to go to some of the modern galleries where some of these modern art pictures are exhibited, and I always come away wondering whether the artists are not really trying to pull my leg. They seem to me to be trying to see how much the public will stand. Many of their paintings and drawings appear to me absolutely childish. They seem to be the work of children who have had a brush or pencil put into their hands and been told to draw something, and they do draw something, but it is not in the least like nature, The houses are all on one side, as though there was an earthquake going on, or you get the two eyes on the same side of the face. I cannot believe that these pictures really attract the public. If they go there they go to laugh, and I think Mr. de Laszlo has rather exaggerated the importance of the part these pictures play in the artistic life of the nation. We must remember always, however, that every great master was ahead of his time. If it had not been so we should have gone on always in the same old rut. It may have been a very good rut, but we should always have pursued the same line in art, and it is only where you get a master who realises that what he has done does not fully represent nature as he sees it, and only where you get him starting on his own line and breaking into something new, that you get great advance. I quite agree that in many cases the advance goes in the wrong direction and leads into a cul-de-sac. For instance, when Manet, to whom Mr. de Laszlo referred, first began to paint, his pictures were looked on in France as ridiculous. They were not admitted into the Salon, and when Manet invited the Empress Eugenie and the art critics to see them they all burst out laughing. I think I am right in saying that during his life-time Manet never sold a picture at all. But his art was disfigured by vulgarism, and that is one of the things to be particularly avoided. Extravagance and vulgarism would kill any picture.

MR. F. C. TILNEY said : I should like to add my tribute of gratitude for this most stimulating lecture from Mr. de Laszlo. This is a great day for good art, almost epoch-making, because it is very seldom, in fact I think it has never happened before, that so distinguished a member of the art profession has had the moral courage to stand up before an audience such as this and to speak with frankness and fairness his very innermost thoughts and feelings. All true artists have these thoughts, and the more exalted of the profession have many opportunities for giving voice to them, but do they ever do so ? I think you will find that on almost every occasion when such an opportunity presents itself, the matter fizzles out in compromises and complimentary loopholes. Mr. de Laszlo has boldly said what he thinks about modernistic art, and its comparison with the traditional art that is happily still with us.

Mr. de Laszlo considers that the artists are themselves to blame. I have heard that many times. People will tell you that in confidence. Painters, for the most part, cannot sell their works for the reason that public interest in art has reached a state of atrophy. The public, being puzzled, washes its hands of the things it does not understand. Artists certainly have themselves to blame because, had they at the outset made a proper stand against incompetence, they could have prevented the

present degradation. That is the opinion of many men, and of most of the Academicians themselves. When Roger Fry brought his Post-Impressionist Exhibition over here it was not accepted with favour by anybody. The Press and the public execrated it. But it was a sensation, and nothing succeeds financially like a sensation. So the matter was taken up by the Press, and Mr. Fry himself was a great advocate for this cult of the ugly and it became " the rage." If at that moment the supreme art institution in the country, the Royal Academy, had formally protested, it would have been listened to. The Royal Academicians would have been regarded as the final authorities. But they were too dignified. They took the attitude of ignoring such nonsense which, they implied, would pass in a few weeks. It has not passed. It is still with us. The Chairman considers that its importance is over-rated. Anybody who goes round the studios will find that among serious artists it is thought to be vastly important.

The materialism that Mr. de Laszlo alludes to may be interpreted as commercialism, and it is commercialism which keeps " modernismus " alive. Art and Commerce are not really partners. If Art flirts with Commerce it generally deteriorates in its morals. It is perhaps heresy to say as much in these sacred precincts, because the Royal Society of Arts admittedly promotes Art and Commerce. The two may work together, certainly ; but Art at its purest cannot possibly have anything of the commercial in its incentives. The artist is of course glad to have money, because he must live, but the payment does not inspire the true artist, although his work may be exploited for commercial ends. If it can be made a craze, a sensation, it pays the exploiters very well.

We must not lose sight of the fact that new art-movements are only fashion ; and the public does not ask for new fashions in anything. The fashions are set *to* the public, not *by* the public. The fashion now is for distortion and incompetence, and anybody, whether he has been to school or not, can pose as an artist, because it is fashionable to do so. How in such dreadful conditions is the real artist to be encouraged ? I do not know how to express my gratitude to Mr. de Laszlo for bringing this subject right into the arena, and I hope this will not be the last meeting of its kind. As a rule, public speakers of eminence are indifferent to the subject.

Mr. Frank O. Salisbury, R.P., said : I should like to congratulate Mr. de Laszlo upon his most able and delightful lecture. It is about time that the artist spoke out in a manly and courageous voice, and we are all indebted to the lecturer for his magnificent address. I should also like to add my appreciation of his portrait of Lord Reading which was shown on the screen. Had he only painted that one picture he would have ranked as a great master.

The Lecturer, in reply, briefly expressed his appreciation of the kind remarks which had been made by the two speakers, and thanked the Chairman for honouring them with his presence that evening.

On the motion of the Chairman a hearty vote of thanks was accorded to the lecturer, and the meeting terminated.

OBITUARY

Sir Henry Wellcome, D.Sc., F.R.S.—The death occurred on July 25th, at the age of 82, of Sir Henry Wellcome, the founder and governing director of the Wellcome Foundation and the inventor of " tabloid " drugs. Sir Henry, who became a

naturalised British subject in 1910, was born in a log cabin 125 miles from Milwaukee, his father being a missionary to the Indians, and as a boy he had plenty of adventures during the Sioux Indian War. After his training as a chemist he moved to London and founded there, in 1880, in conjunction with the late Mr. S. M. Burroughs, the firm of Burroughs, Wellcome & Co., of which after some time he became the sole partner and which in 1913 became the Wellcome Foundation under his governing managership. Under his direction the firm was characterised not only by commercial success but also by its interest in the welfare of its staff. Sir Henry Wellcome did everything possible for the educational and social betterment of his workpeople.

Sir Henry was intensely interested in research, and spent much money on its promotion. In this country he founded at intervals from 1894 onwards a series of research laboratories which were finally merged, in 1931, in the Wellcome Research Institution in Euston Road, London. Abroad he founded the Wellcome Tropical Research Laboratories in connection with Gordon Memorial College at Khartoum, to which was attached a floating research laboratory which cruised through the waterways of the Nile and its tributaries, and he had a great part in the foundation of the Gorgas Tropical Research Laboratories on the Panama Canal. During the War he provided a chemical and bacteriological motor field-research laboratory which was put to good use in Palestine and Egypt. Sir Henry Wellcome was also greatly interested in archæological research. He personally conducted explorations in the Upper Nile in 1901 and 1910, and he was a pioneer in the use of aerial photography for exploring and surveying archæological sites and recording excavations.

Sir Henry had been a Fellow of the Society for over fifty years and had only recently retired from the office of Vice-President, which he had held since 1932. He was a generous guarantor of the Exhibition of British Art in Industry at Burlington House.

NOTES ON BOOKS

ECONOMICS OF ENGINEERING. By Professor B. C. Chatterjee and L. D. Coueslant. Benares: S. N. Chatterjee. 12 rupees.

This is the revised edition of a book by the Professor of Electrical Engineering in Benares Hindu University and the Principal of the Behar College of Engineering. It is written primarily for Indian students and engineers, and the preface contains a plea that young Indian engineers should aim at something beyond the safety of a salaried post and become "adventurers." In the opinion of the authors, such students might do a great deal worse than take up the study of the business aspect of engineering, as an alternative to politics.

The book is in part only a text-book, and is predominantly a book of reference. The opening chapters contain a vivid and on the whole reliable account of money, and monetary theory, and the contemporary difficulties of that difficult subject are not shirked. Some of this exposition of financial theory and practice is very readable.

The book then proceeds naturally to an account of book-keeping for engineers in which the elementary notions of double entry are well, though by no means exhaustively, set out. There is then a good chapter on the origins of the present industrial system; and this, in turn, is followed by a severely practical treatment of the problems to be met in building an engineering works and organising its work when built. Power, mass production, timekeeping and costing methods are explained with considerable lucidity. There is a good chapter on the laws affecting an engineering factory in India, and some final chapters which return to economic history, and treat

of the Industrial Revolution and labour conditions and the problem they present to the entrepreneur. There is a good index.

Whilst the book is naturally written mainly with an eye on Indian conditions, there is much in it that the English engineer would find both interesting and suggestive. It is well printed, and provided with illustrations and factory plans : but its 600 pages are somewhat heavy to handle.

FOOD, HEALTH, VITAMINS. By R. H. A. and Violet Plimmer. Seventh Edition. London : Longmans, Green & Co. Ltd. 3*s*. 6*d*.

FOOD VALUES AT A GLANCE. By Violet G. Plimmer. London : Longmans, Green & Co. Ltd. 3*s*. 6*d*.

The Society is now giving considerable attention to problems of nutrition which at bottom are probably the most important of any of those which beset the nation at the present time. Bound up with their solution are three aspects of public policy : the health of the nation, unemployment, and agriculture. The Albert Medallist, Sir Frederick Gowland Hopkins, devoted his Trueman Wood lecture last year to this subject, and it has been elaborated with authority by Sir Robert McCarrison in the recent Cantor Lectures. Readers of these lectures will probably be concerned with their own dietary and anxious to select the most suitable ingredients : they will wish to know more about the composition of the usual foods. It is for this reason that attention is called to two books which have been well tested and are quite up-to-date, give this information in a very readable manner and are well worth perusal by any who are concerned to keep in good health—especially if they be town dwellers, most of whom, it is now recognized, suffer at one time or another from a deficiency of some particular vitamin, even if they overfeed in other directions.

The special feature of the Plimmers' book is the definition of the complete diet as a square meal : this is illustrated by means of a coloured diagram, which assesses at a glance the vitamin content of the useful foods printed on a coloured background, as well as indicating on a white background the common foods of a similar nature which do not supply the vitamin. In the subsequent text other diagrams represent the various ways in which a diet fails to achieve squareness.

The Plimmers, like other authorities, insist on the necessity for an optimum and not a minimum supply of vitamins in the diet. It is important also that a sufficient number of calories should be consumed by those on a reducing diet, particularly during inclement weather. Under town conditions we are most of us exposed to infections of every kind and it is highly desirable to maintain a considerable margin of resistance.

It is well to emphasize, even at the risk of repetition, the importance of eating vegetables fresh if they are to preserve their vitamin content. It is to be feared that much of those eaten in London and imported from abroad is of no vitamin value when eaten : the consumer has paid a high price for it in vain. We must encourage our own market-gardening in close proximity to the towns and speed up the delivery to the consumer in every possible way.

In Mrs. Plimmer's *Food Values at a Glance* she has adopted graphic methods, with brightly coloured charts, of indicating the composition and vitamin content of a large number of the ordinary foods in daily use. Other charts in black and white illustrate the content of these foods in the various ingredients like calcium, phosphorus and iron, which are essential to the body. The book contains examples of standard diets, both for individuals and for schools and institutions, and of course the analytical figures from which the graphs are drawn. Such a book cannot fail to be most helpful.

E. F. A.

THE SEAS AND SHORES OF ENGLAND. By Edmund Vale. With an Introduction by Sir A. Quiller-Couch. London : B. T. Batsford Ltd. 7*s.* 6*d.*

The imagination of our vast urban population (over eighty per cent. of the total) is nowadays exercised by many interests, serious and absurd, but not much by the five British seas, or by the sea at all. The desire to bathe in salt water for a week or two in summer is a plain physical desire : we go to the seaside to gratify it. Bathing is agreeable and healthy. And necessity being the mother of habit, the millions have grown to like the accessible crowded beaches best ; and the few who want to get away from the crowds want to find themselves rather than the sea.

Steam has finally made Captain Marryat " period." The Goodwin Sands, which certainly had a wonderful reputation with bright boys not so long ago, have ceased to be a terror, and the brave hovellers of Deal, Mr. Vale tells us, are extinct—they were the men who put out in little boats to save life on the quicksands. At the same time there has been a concentration of maritime traffic in the bigger ports, and this has meant loss of atmosphere as well as of trade for the smaller. In these, a real, fishy, briny smell has become quite a rarity ; Londoners strolling on the quays wonder whether the old tars smoking their pipes on overturned lobster-pots are really seamen, or only local men got up to look the part—W. W. Jacobs characters, in fact ; on the other hand, the speed-boats which roar up and down in the bay suggest chauffeurs and garages rather than sailors and havens.

However, a tour round our shores with Mr. Vale soon proves that a good deal of our coast country remains unspoilt. The photographs he has chosen to illustrate the beauty of the Welsh coast are particularly impressive. Of the Irish sea, whose waves dash upon it, the author says : " I feel certain if it had been anywhere else but in Britain we should have ' discovered ' it long ago." The picturesqueness of parts of the land enclosing the Bristol Channel (or better, the Severn Sea) is not undiscovered. Fig. 53 is a lovely picture of line upon line of sleepy breakers crawling up Saunton Sands, and Ilfracombe, on the preceding plate, looks like a strip of the French Riviera.

Mr. Vale has a good deal to tell us about history, old customs, and geology. Holyhead stands on one of the oldest known kinds of rock : Whitstable oysters were sent to ancient Rome to the Emperor's table : and if you are clever you can steam from Hull to Zeebrugge and back again with the advantage of the tidal stream both ways. This is a good book for all who are sensible enough to want to know about the seas and shores of England. P. B.

GENERAL NOTE

EXHIBITION OF COTSWOLD ART AND CRAFTSMANSHIP.—An Exhibition of Cotswold Art and Craftsmanship will be held in the Church Room, Chipping Campden, Gloucestershire, from August 1st to 31st, and will be open on week-days from 10 a.m. to 7 p.m., and on Sundays from 2.30 to 6.30 p.m. The price of admission is 6d. (children 3d.). This is the fifth exhibition in a series which is generally acknowledged to be of the first importance, and only examples of the finest craftsmanship are shown. Last year's exhibition was attended by over 3,000 visitors. The exhibition includes Furniture and Joinery, Textiles, Pottery, Wrought Iron, Silversmithing, Printing, Calligraphy, Heraldry, Stained Glass, Jewellery, Needlework and Embroidery, Oil Paintings, Water-colours, Drawings, Etchings, Woodcuts, Sculpture, and Architecture and Building.

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PROCEEDINGS OF THE SOCIETY

INDIAN SECTION

FRIDAY, JULY 10TH, 1936

SIR EDWARD A. GAIT, K.C.S.I., C.I.E., in the Chair

THE CHAIRMAN, in introducing the lecturer, said: The Royal Society of Arts has been in existence since 1754, but the present is the first occasion on which an Indian chief has read a paper before its members, and we hope it will establish a precedent which will be repeated in the future. The Raja of Aundh, who has kindly undertaken to read a paper this afternoon on Indian painting, has already established another record as he was the first Indian chief to take a degree. He took a B.A. at the University of Bombay in the year 1894. He has been interested all his life in Indian painting, and the paper he is going to give will represent the conclusions to which he has come in the course of a long study of the subject.

The following paper was then read:—

THE ART OF PAINTING IN INDIA

By BHAWANRAO PANDIT PRATINIDHI, Raja of Aundh

On this fortunate occasion I am able to place before you my views on the development of painting in India from olden times up to the present, and I shall illustrate the subject with some lantern slides in colour of several paintings from the old tombs of Egypt and from the marvellous paintings at Ajantha in Hyderabad State, which are, as you know, a combination of Persian art and the different types of old Indian art.

Indian painting is very old. I think it is as old as the Vedas, the oldest books of knowledge in the world, for there is a mention of it in the Rig Veda, where it

speaks of there being a portrait of someone. Then in 700 B.C. Panini, the great Sanskrit grammarian, mentions Indian painting in his book on grammar, and in 500 B.C. Kowtilya, the writer on political economy, also mentions the art of painting. However, no specimen of Indian painting dating from before 200 B.C. is still extant anywhere in India, but in one of the caves at Ajantha (Cave No. 10) we have an inscription which shows that the cave was carved and painted about 200 B.C.

I must tell you first of all what the Ajantha caves are. About ten miles from the village of Ajantha in H.E. the Nizam's dominions there is a horseshoe range of hills, in the middle of which there are carved about 36 caves, some facing south and the others facing east. Some of them are as big as this hall, some twice as big, and of solid rock and granite. The walls have been plastered with mud, but the mud plaster is so firm that it does not give way unless some instrument is forcibly used on it; and on that plaster all the paintings have been painted. We call them the Ajantha Frescoes, but as a matter of fact they are not frescoes at all because on a fresco the plaster is not dried, whereas these paintings have been done after the plaster was dry. These caves were being painted from 200 B.C. to 500 A.D. There are similar paintings at other places also, such as Bagh in Gwalior State, Sceta Navasal in Pudukkottai State in Madras Presidency, and in Bengal; but the best are at Ajantha.

Just before I came to Europe I saw the Queens' tombs at Luxor. They date, as you know, from about 1500 B.C., and I think that the art of Egypt is much more crude and has less expression than the art of Ajantha. In Egypt there is no expression on the faces of either the people or their gods. I noticed particularly the hand of a queen where the thumb had been painted on the wrong side. The artist was therefore sometimes wrong in Egyptian paintings, which means that his art was much more crude than what we have in Ajantha. In Ajantha the anatomy is perfect, and the artists have drawn men and women and animals very well. It is only in the Rajput school afterwards that the painters began to draw very short persons and animals. The Mogal school vary their women and men.

At the same time I must draw your attention to the fact that the colours used at Ajantha are the same as those used by the artists of Egypt. The Indian artists employed only the following colours: yellow ochre, red earth, *terre verte*, lapis lazuli blue and lamp black. I do not know what the Egyptians used for white, but in India they used Shirgola stone, which, when baked, turns out a beautiful white. The white at Ajantha is as white after 2,000 years as if it had been painted yesterday, and the same thing is found in Egypt. The Egyptian caves were shut up for centuries, and have only lately been excavated and their paintings brought to light, but the Ajantha caves were open for centuries because the monks lived and prayed there, and many visitors must have visited them. The colours, however, have not faded, not only in the dark caves but on the verandahs, some of which face the south, and as you know we have rain coming from the south.

The paintings on the verandahs, therefore, receive the force of the rain, wind and sun for at least three months out of the year, and still the colours are as bright as colours can be.

There are several tests to apply to a painting to see whether that painting is good or otherwise. The first test is outline. If the outline is not correct, not perfect, then, however bright the colours may be, the painting to my mind would not be a good one. The outline in all Indian paintings, and Egyptian paintings, is marvellous, extremely fine and exquisite. Its sweeping outline is really the beauty of an Indian painting. I have known in my father's court an old artist drawing an elephant about six feet high. He would hold his brush, dip it in black colour, begin from the top and immediately come down and finish at the end of the trunk of the elephant without taking his brush off. Those outlines with a firm hand only Indian painters know how to make.

The brush work, too, of the Ajantha paintings, and of Indian paintings in general, is very soft. You cannot see the lines made by the brushes. In the old days the painters made their own brushes from the hairs of a squirrel's tail or the hair from the stomach of a young goat. I myself in my childhood made brushes from these hairs. Then the colours. I have seen many galleries during the last four months throughout the whole of Europe. Some of the colours of the paintings are faded, particularly the green and red, and some of them are darkened. The colours of Ajantha are earth and mineral colours, and not vegetable colours, and their brilliance is still preserved. Also, the fewer the colours a painter uses the better he knows how to use them. Ajantha painters used only six colours and their combinations.

The next test is perspective. The perspective at Ajantha is not always correct. It is only in perspective that many of the Ajantha pictures are defective, but so too are almost all the Mogal paintings, and all the schools derived from the Ajantha and the Mogal schools. Even the European pictures painted in the fourteenth century and before that sometimes show incorrect perspective.

Good composition, or grouping of persons, animals and other objects in a picture in the proper places, is also necessary for a good picture. The composition at Ajantha and generally in all the schools derived from Ajantha is very good. The king on horseback watching a lady, the dying princess, and the conversation between a Nag king and the Druid king, are some of the best examples of very good composition.

Then comes the history. We can learn from these paintings about the drapery of the people of those times, about the ornaments that men and women wore, about their method of dressing the hair, and about their fashions of sitting and standing. We learn what musical instruments these ancient people had, what arms they used, how they sat and rode their horses, how they dressed their horses, what domestic and wild animals they kept, and so on.

In 1926 I took to Ajantha about 15 artists, and kept them there for a

month, and I now have in my collection 15 copies from Ajantha, done exactly the same. The caves are dark, and one cannot see without light, and you will ask how the painters painted the caves and the copies. Well, I put a big mirror out in the sun on the verandah, and by a series of reflections transmitted the light to a white cloth stretched on a frame inside the caves, and thus light was given to all the artists. Otherwise, if we had had artificial light, the colours would not have shown up perfectly correct, but with the sun's light we could see the natural and exact colours. A question arises in one's mind as to how the original painters painted their pictures. There were no mirrors in those times, and I think the people who had the caves painted had big white metal sheets, properly burnished and shining, and these sheets must have been kept outside the cave and the reflection thrown on the walls, and in that light they could have done their paintings. It is impossible to account for the exquisite colours of the paintings otherwise.

Then, what was the object for which the paintings were made? I suppose they were made only for God, not for monetary considerations. You know how the old painters of Europe painted pictures from the Old or the New Testament because of their devotion to God or Christ. Therefore their ideal was the highest. When an artist goes to a man and wants to paint his picture he always gives him some credit for being very beautiful, always pays him some compliment, and perhaps sometimes spoils his likeness. But not so with these old artists. The expression of the faces is wonderful at Ajantha, and the expression on some of the figures whose faces are turned away from us is indicated by their arms or legs.

Curiously enough we have no painting extant from the fifth century A.D. to about the thirteenth century A.D. There is no such painting in my collection, which is a large one, and I have not found anywhere in India any painting dating from that period.

I would thank you for the kind and patient hearing you have given to what I have said about my art in India. I love my art, and I wish that all Indian artists would strive their best to adopt the same art of Ajantha, with better perspective and the same colours. I know we artists are sometimes lured by the brightness of the colours we can buy, but most of them fade or darken, and therefore I only use about ten colours.

PROFESSOR R. A. DARA said: I have been interested for a good many years in this subject, and have greatly enjoyed the lecture. The lecturer asked if there is any Indian manuscript or painting in existence between the fifth and thirteenth centuries. There are two palm leaf books painted with miniatures of a school at Nepal, one dated 1015 A.D., now at Cambridge, and another like it at Calcutta, dated possibly fifty years later; besides the frescoes on the walls and ceilings at the Jain Temple at Tirumala, in the north Arcot district of Madras, dating from the eleventh

century A.D. It should not be forgotten that there are more old Indian paintings in Europe than there are in India.

THE CHAIRMAN then proposed a hearty vote of thanks to the lecturer for his paper. This was carried unanimously and the meeting terminated.

NOTES ON BOOKS

THE RULE OF TASTE. By John Steegman. London: Macmillan and Co. 10*s*. 6*d*.

"We have a standard inch, a standard foot, and standard pennyweights, pecks and perches, but we have not got a standard beautiful face; moreover, we have temporarily given up trying to find it. As a matter of fact, the eighteenth century had not found it either, but it never gave up the search and always maintained that it existed." This sentence might serve, as any sentence in Mr. Steegman's admirable book might do, to suggest the pointed quality of his style and the preciseness of his observations. The book is perhaps worthy to rank with three other books dealing with matters of taste and style which have appeared in the last twenty years and which are excellent in their kind. I mean the late Geoffrey Scott's *Architecture of Humanism*, Mr. Christopher Hussey's *The Picturesque*, and Mr. Kenneth Clarke's *The Gothic Revival*. All three are included in Mr. Steegman's bibliography. Mr. Steegman may have learnt from them, but his own contribution to our education and entertainment is distinct.

One feels as one reads that our arbiters of taste in the second half of the eighteenth century were very lucky in one respect: the size of their task was not inordinate. Their own size enabled them to feel equal to it. Their size, as a body or class, was small; their size as a social and financial power was great. And what was the problem? Persons of Quality in a state that felt itself, after 1715, mighty and secure, were conscious of not being as civilized as their opposite numbers in France and Italy. "Taste had been lacking, therefore taste must be acquired, but before it could be acquired it must be defined, and its application in any given direction having been defined it must be formalized. Formularized too . . ." So there followed an immensely important age, from the point of view of English art. On the whole its mannerisms were effectual, beautiful, and indeed sincere, and though no doubt spontaneity had to take a back place, one permanent benefit to art and civilization rose out of the state of affairs: by dint of art and its canons being constantly discussed in fashionable circles, art acquired status, art became a common plane for aristocrats, dilettanti and the artists and craftsmen themselves to meet upon. At all times, the more people who understand what other people are talking about when they use certain words, certain epithets, and appeal to certain standards, the better. And art is an art of peace.

The Rule of Taste began with a Revival of Antiquity. England experienced a sort of Baroque Renaissance of her own, and in the main, during the period that Mr. Steegman deals with, "the supremacy of the Ancients and the existence of the Ideal were alike hardly called into question." And to the tradition which was formed we owe much besides the great mansions of the age and the contents of our museums: we owe for instance the "small, dignified red-brick or stone-fronted houses, built by no named architect" which still stand for good manners and an unfunctional ideal of beauty in nearly every town in the land. We have heard so much about function lately; it is perhaps time to talk more about structure. The feudal and rural manor had had structure: with the diffusion of Taste in the eighteenth century the towns

got a modern, a truly urban and civilized structure too. The Rule of Taste has a good deal to do with proportion. The geniality of life likewise depends on the individual's feeling that he stands in a right, manageable relationship to his surroundings. To such a sentiment skyscrapers, slums, and ribbon development are inimical. The sense of proportion which the eighteenth century cultivated was expressed in arts and graces, but it radically and usefully touched life at all points.

A relaxation of discipline came with the rise of the Adam brothers in architecture and of Goldsmith in literature. Later again, with the Regency, Mr. Steegman's book ends and culminates. It is learned, amusing and fully worked out. The author obviously got much pleasure in writing it, but not more than the reader gets in reading it.

NATURE IN BRITAIN. An Illustrated Survey. Introduced by Henry Williamson. London : B. T. Batsford, Ltd. 5*s*.

First Mr. Williamson, like a Philosophical Savage, steps forward, puts down his bright spade, and discusses at the same time the subject and the contributors with a large unmodern benignity. " My own personal belief," he says, " is that animals and birds, which are structurally akin to us, and appear to feel and act in many ways as we feel and act, are best to be understood by those despised individuals who ' humanize ' them." How correct he is. How much nearer to the mark we get through even excess of identification of ourselves with animals than if there is a lack of it. We must have zoologists, we need animal-lovers, too. Their " love " is not always absurdly sentimental. Animals are all right—unless put in false positions by human beings, and sometimes then, too. Three elephants who were seen the other day walking down the King's Road, Chelsea, compared favourably with the people wedged in buses, the people cramped over the handles of bicycles, the people seizing an opportunity of dashing across the road on their own legs ; they—the elephants—were so dignified, so indifferent to the mechanical fashions and sartorial foibles of the moment.

However, elephants are not a part of Nature in Britain. Nor is this book all about animals, it is about trees and flowers as well. It is a very good and handy little book to possess.

Miss Frances Pitt deals with our mammals. She is so much their friend that she tends to gloss over their faults, even when they most obviously have them. Her own savage and rather ungrateful wild cat is shown tender and considerate to its mate. The grey squirrel is, Miss Pitt admits, " not a desirable addition to our fauna." Might one not go further, and say the grey squirrel is a rather sinister rat with a bushy tail ? A different creature from Squirrel Nutkin !

The general reader is likely to learn much from Mr. Seton Gordon in his chapter on birds. Thus it appears that many of our blackbirds are only winter visitors, who return in spring to northern lands. What a good thing they are not all this kind ! In May and June the back gardens of London echo at sunrise and sunset with the precious song of the native contingent. One would be sad without them. An English garden (country, this time) is more full of bird song in May than perhaps any other place in the world. The British coasts know a great profusion of species, and lately, by the way, two " documentary " films, very intelligently produced, have familiarised thousands of the general public with them.

Mr. E. G. Boulenger, dealing with reptiles (he also has a chapter on Pond and Stream Life), shows the usual indignation of the ophiologist at the presumed unwillingness of his readers to like snakes. It seems that some people do not even like

lizards. This is strange indeed. Two of our three English lizards (the slow-worm is the third) are charming, lively little creatures—and very useful in keeping down insect pests. As for the adder, he makes up for occasionally poisoning a human being by destroying " quantities of mice, moles and other vermin." Mr. Boulenger tells us that there is probably no foundation for the belief that the mother adder swallows her young to protect them. The *Field* once offered a reward for conclusive proof of an adder having swallowed its young, but the money was never claimed.

Mr. L. C. Bushby is our guide through the strange insect world of butterflies and moths and slugs and bugs, some so beautiful, some so ugly, and some rushing at different stages of their career to either extreme of looks. We are not surprised to read that the puss moth caterpillar can scare a bird when it " makes a face " in the manner Mr. Bushby describes.

On trees our authority is Mr. St. Barbe Baker, well known for his propaganda for re-afforestation. He writes learnedly and entertainingly of the character of our trees, and has plenty of lore as well as science—the two things are not necessarily different. Sometimes they are. " He that beareth a branch (of the whitethorn) on hym . . . no thundre, ne no maner of tempest, may dere hym, ne in the howse that yt is ynne may non evil ghost enter." Mr. Robert Gathorne-Hardy writes with dash and style about flowers, and the book is worthily rounded off with a short essay by Mr. Edward Gathorne-Hardy on fungi. " It is a noble race indeed which gives us truffles and champagne."

THE MATERIALS OF MEDIEVAL PAINTING. By Daniel V. Thompson. London : George Allen & Unwin. 7*s*. 6*d*.

" Human energy is limited," says Mr. Bernhard Berenson in his foreword to this book, " —or at least mine is ; but if I had greatly more, there is nothing about all the ancillary aids to the understanding of a work of art that I should not try to master."

The technique, or chemistry, of painting is certainly not the first aspect of the art that ought to attract attention. There are several reasons why this must be true. One is that art is the more effective if its craft is hidden, that is, not apparent at a first impression. Another is precisely that the analysis of technique is the analysis of effect. In cooking, likewise, the effect may be said to precede the contrivance. We analyse the dish of *sole au vin blanc* because it agreed so well with our palate. We contrive the *sole au vin blanc* with a view to making it taste in such and such a way. This analogy will not be strange to Mr. Thompson, who begins his book by saying that it is " designed for those who care for what my dearest enemy calls ' the cookery of art.' "

On the other hand, anyone with a serious and persevering interest in painting must sooner or later become very inquisitive about the chemistry, the " cookery," of art, as well as about the carpentering and other auxiliary craftwork it may involve. The problems which rise are of course not confined to the colours or pigments. One wants to know about the carriers (canvas, wood or whatever it may be) the direct ground, which may or may not be a carrier, and the binding media. The pigments make the most important part of the subject, and Mr. Thompson has naturally devoted most of his space to them. His last chapter deals with the metals which found a considerable place in medieval painting, and which would not be out of keeping in the work of contemporary *surréalisme*.

Needless to say, the name with most figures after it in Mr. Thompson's index is that of Cennino Cennini. Among the other authorities he quotes is Bartholomew Anglicus on the colour dragonsblood. " According to Avicenna, the dragon wraps his tail round the legs of the elephant, and the elephant lets himself sink upon the

dragon, and the blood of the dragon turns the ground red ; and all the ground that the blood touches becomes cinnabar, and Avicenna calls this dragonsblood." But quaintness is only a minor ingredient in this interesting book, and the author applies his knowledge in an illuminating way. For instance, he explains that the brownness of grass and foliage in many Italian pictures is due to the artists' incautious use of verdigris, which is only comparatively permanent when used in panel pictures in tempera. "We sometimes find seventeenth- or eighteenth-century copies of Renaissance pictures in which portions which are now brown in the originals appear as green, showing that the green of the verdigris survived for two or three hundred years."

This example is enough to show that the critic and the amateur have a good deal to learn from the workers in the laboratory of fine art. It is not only oil itself which (except when used by the Flemish Primitives) turns pictures from their true colours. The pigments themselves play various tricks. These were to some extent known a long time ago, but only by a few chemists—or rather alchemists—of the past. Greek science was not altogether lost, and in the Middle Ages the body of knowledge was preserved and added to by the Moors, even more than by the Christians. We are far from knowing everything about pigments even to-day ; thus Mr. Thompson tells us that it is not understood how vermilion sometimes comes to turn black.

The book is not too technical for the average reader (who cares for the subject) to be able to learn from it. It is easily written, sensibly subdivided, and elegantly produced.

THE HIGHLANDS OF SCOTLAND. By Hugh Quigley. Photographs by R. M. Adam. London : B. T. Batsford Ltd. 7*s*. 6*d*.

Of the collaborators in this book Mr. Adam has had perhaps the more grateful task. About the Highlands, visually speaking, there are not two opinions. They are romantic, rugged and beautiful. They are not stupendous, but nearly so, nearly enough for anyone who is not peculiarly susceptible to figures. The constant presence in the Highlands of mountain, water and cloud, make the place seem to have a closeness to nature which larger scenes are less favoured with. See Plate 14, "Looking across Loch Linnhe to the Ardgour Hills." (This is one of the best of Mr. Adam's excellent photographs.) How the loch sparkles in the dank yet keen air : how real the forest which grows down to the shingly inland beach. And the clouds form and reform, and clash with the mountain ; and there is a gaiety and extravagance of April, sunshine and shadow, fire and ice.

The great enterprising nineteenth century imposed itself in the strangest way on the Highlands. It annexed their romance to Belgravia. Busy people are too busy to be poetical, and to-day, in this just as busy though more democratic century, the more altruistic talk about standards of life, not about the Good Life. The Highlanders are to be redeemed from their gillie-slavery, and given a chance of being more industrious in the approved modern way. Even Mr. Quigley wants them to line up with the Swiss in competition for the tourist trade. "The Highlands can become the greatest playground of Europe ; they are already vested with the glamour of association with great historical movements of the past."

Since there was never an age when it was more true that if people do not hang together they will hang separately, perhaps we must resign ourselves to the Highlands being electrified and brought up-to-date. Normal individuals go to the wall when not in association, and better a living dog than a dead lion. All the same, one hopes that developments in the Highlands will rather take the form of an expansion of small home industries, of the fisheries and forests, than of the heavy industries.

Mr. Quigley, be it said at once, is not here mainly concerned with such problems. His book is as to nine-tenths a fine account of nature, and of that simple but elect human stock with which the Highlands are populated. There are towns too, delightful ones. The broad centre of Grantown-on-Spey (Fig. II) has the dignity of a university town. And there are castles—without that archaic, anachronistic look that they have to-day in the south. Their turrets harmonise with pines and mountain peaks, and rise like crags out of the lochs.

This is a good topographical book ; if it gives away certain secrets little harm will be done, because most of us swarming southerners are too far away to take advantage of them, and we should not have the heart to do so if we got the chance. P. B.

SYNTHETIC RUBBER

It has been recently stated that more than fifty useful synthetic products can be made from acetylene, of which synthetic rubber is the most important. Acetylene itself is made quite easily from calcium carbide ; the older generation of motorists will remember using it for their headlights. The carbide used in this country is all imported ; a recent application for facilities to begin its manufacture here was opposed by Parliament. It can only be made on a competitive basis where the cheapest water power is available, as at Shawinigan in Canada, Niagara Falls or in Norway.

The position of the natural rubber industry is well known : of late years it has had many vicissitudes. Since it gives employment to at least a million workers and has a great deal of capital employed in it, wide interest is taken in its commercial and technical prosperity. There can be no more economical producer of rubber than *Hevea Brasiliensis*, particularly now that yields of 1,200 lb. per acre are to be expected in the future as the result of botanical research and development, compared with the present average yield of 400 lb. Until recently the search for new uses and applications of rubber has lacked driving force, and supply has outstripped demand. The failure is in part due to the shortcomings of natural rubber and its lack of uniformity ; it is subject to deterioration by oxidation, it fails from fatigue, it lacks resistance to abrasion, it deteriorates rapidly under the influence of many chemicals. Rubber growers and rubber users and their chemists can do much to overcome these objections, but a loophole is left for the synthetic manufacture of uniform products possessing special properties which may be of such value as in part to counteract their excessive cost as compared with that of natural rubber.

Two other considerations also apply to the question—the need to save foreign exchange by curtailing imports of rubber, and independence of foreign raw materials in case of war.

Thus it is reported that a substantial tonnage of synthetic rubber is to-day being made in Russia, the process being based on alcohol, which is converted under conditions of high temperature cracking into butadiene, which is polymerised to rubber.

Far more serious as a competitor of rubber is the production of a material named Du Prene by the Du Pont Company in the United States, since this is on a commercial scale in a free market. The series of operations comprises the polymerisation by a catalyst to vinylacetylene to which is next added hydrogen chloride, the product being named chloroprene. This is condensed to the chlorinated synthetic rubber. The final cost of Du Prene depends on the yields obtained at each stage of the process ; it would be low if they were theoretical, but no chemist would expect this

to happen in reactions of this type. Research and experience have continuously improved the yields since production began, and as the other main cost is that of the exacting chemical control of the operations, it is to be expected that the present cost will fall as much larger quantities are manufactured. The present plant at Deepwater, U.S.A., is producing at the rate of one million pounds per annum.

Du Prene is stated to be superior to natural rubber in almost every respect except in regard to odour and colour and some electrical properties. It is expected ultimately to replace a proportion of the natural rubber now used, in spite of the fact that it will probably always cost more. For certain purposes Du Prene has definite advantages, as, for example, in packing glands because of its resistance to heat, oils and chemicals; further as an insulating material in high-tension power cables and automobile ignition cable. Tyre treads of the material will wear 20 per cent. better than high-grade rubber treads, though rubber produces better compounds for the carcass of the tyre. Since pneumatic tyres consume well over half the total rubber production, this superiority of Du Prene is promising for its use.

There is also a synthetic rubber industry in Germany, greatly encouraged by the State for defence purposes.

It would appear that whereas natural rubber is not likely to be menaced by ordinary synthetic rubber in a free market in countries whose economic policies are based on normal trading, it will have to take into account what we might term chemically different, synthetic competitors which have superior properties such as those conferred on Du Prene by the presence of chlorine. It is likely that the number of these may grow with experience to the advantage of users who are willing to pay the enhanced price for the more useful substance.

OIL FROM COAL

The theme of oil from coal is being much discussed in the public and technical press because of the importance of both maintaining an active coal mining industry and providing the nation with a home supply of an essential commodity. The subject is a complex one, being both political and economic in character, and few seem to understand it fully, hence the following attempt to explain some of its ramifications.

It is well known that on distillation an oily tar is obtained from coal: this operation is carried out at every gasworks where, since the main object is to make gas, a high distillation temperature is customary. Coal may also be distilled at lower temperatures by the so-called low-temperature carbonisation process, when rather more tar is obtained, which, however, is of a somewhat different character. Neither of these tars is the same as crude petroleum oil; they differ in particular, using the language of the chemist, in containing less hydrogen per unit of carbon than is contained in petroleum; so that to make the equivalent of petrol from them, they have to be hydrogenated, that is, have hydrogen added to them.

A proportion of one kind of motor spirit is obtained from gas and low-temperature tars. This is the well-known benzole usually marketed in admixture with imported petrol. Benzole is home-produced motor spirit, though it is chemically not the same as petrol. Much of the gas tar produced is used on the roads after suitable preparation. The balance constitutes what is called creosote oil and it is this product, together with the low-temperature tar, which is being hydrogenated by Imperial Chemical Industries, the product being a petrol of the usual character.

Imperial Chemical Industries have gone further still in being able to hydrogenate coal itself, for which purpose it is finely ground and mixed into a paste with oil. The operation is one which can only usefully be carried out on a very large scale; it

demands a complicated plant, working under great pressure and temperature. The process is known to be technically a success and to be producing regularly considerable quantities of petrol; its economics have still to be established, and it must be remembered that it has the protection of the *8d.* per gallon duty levied on imported spirit, but rebated at present on the home-produced article. The high capital cost of the coal hydrogenation process will tend to restrict its extension: it is possible, however, to hydrogenate the tars in relatively small and less costly installations.

There arises the problem, therefore, how to produce these tars in much greater quantity, and it is this aspect of the question which is receiving particular attention in Germany to-day, where large quantities of tar are shortly to be produced by the low-temperature carbonisation of brown coal. The extension of low-temperature carbonisation plants in Britain for the same purpose is often advocated: it must be realised, however, that the main product of these is solid fuel and that the production of this in suitable form, and its sale at a profit, is still largely in the experimental stage.

There is still a third method of producing petrol, which starts, as it were, from coke, which is easily converted into water gas by interaction with steam. Water gas contains carbon monoxide and hydrogen, which gases can be made to combine by passing over a special catalyst under suitable conditions, yielding a liquid product which is largely identical with petrol. The process is chemically a remarkable one; it is identified as the Fischer process, after its inventor, and has been the subject of much study in several countries. It does not need pressure or any very high temperature for its operation. The process is not yet in commercial operation, but pioneer plants are known to be under construction in Germany, France and England: if successful, it would lend itself to relatively small installations.

It may be asked, and rightly, why bother to make oil from coal by processes which are bound to be expensive, when oil can be so cheaply obtained from the earth in favoured regions and cheaply transported in bulk to any destination? The answer is bound up in the unfortunate failure of man to avoid international jealousies and the fear of warlike aggression. Instead of the scattered bounties of the earth being free to all alike, commercial tariffs, political restrictions and fear of war condemn us to the study of alternative and basically uneconomic methods of preparing substitutes.

It falls to the chemist and the engineer to solve these problems and they are in no way to be blamed if they are successful. E. F. A.

GENERAL NOTE

THE SECOND INTERNATIONAL CONGRESS OF THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS, LONDON, APRIL 19–24, 1937.—At its first Congress, held in Zurich in September, 1931, the International Association for Testing Materials accepted an invitation from the Committee representing British members to hold the next Congress in Great Britain, and recently the Permanent International Committee approved the suggestion submitted by the British Committee that the Congress should be held in London from April 19–24, 1937.

The object of the Congresses held by the International Association for Testing Materials is to obtain international co-operation in the study of materials and their testing, and to provide facilities for the exchange of views, experience and knowledge with regard to all matters connected with this subject. The London Congress should be of considerable scientific and industrial importance, particularly in view of the length of time which has elapsed since the study and testing of materials

were last reviewed on an international basis. The proceedings will be based on selected papers which, by invitation of the Group-Presidents appointed by the Permanent Committee, have been contributed by leading authorities in their respective fields in the principal countries throughout the world. Most of these invitations have been issued and approximately 150 papers are already promised.

The organisation of the Congress has been undertaken by a Congress Organising and Reception Committee, which consists of the British Committee of the International Association for Testing Materials and representatives of many leading British Technical Institutions, Scientific Societies and Industrial Organisations. The Executive Committee of the Congress Organising Committee is composed as follows :—

Sir Frank Smith, K.C.B., C.B.E. (*Chairman*) ; Sir William Larke, K.B.E. (*Vice-Chairman*) ; Sir Harold Carpenter, F.R.S. ; Sir Alexander Gibb, F.R.S. ; Dr. H. J. Gough, F.R.S. ; Sir Nigel Gresley, C.B.E. ; Sir Clement Hindley, K.C.I.E. ; Mr. K. Headlam-Morley (*Honorary Secretary*).

Sir William Bragg, O.M., K.B.E., President of the Royal Society and Director of the Royal Institution of Great Britain, has consented to be President of the London Congress.

Participation in the Congress will be open to all interested in the study of materials and their testing on payment of the membership fee.

The subjects selected for discussion at the Congress are divided into four groups dealing respectively with Metals, Inorganic Materials, Organic Materials and Subjects of General Importance. The following subdivisions of these groups have been adopted :—

Group A.—Metals. (President : Professor C. Benedicks, Sweden ; Vice-President : Dr. H. J. Gough, F.R.S., Great Britain). (1) Behaviour of Metals (mechanical and chemical) as dependent upon temperature, particularly in regard to high temperatures. (2) Progress of Metallography. (3) Light Metals and their Alloys. (4) Wear and Machinability.

Group B.—Inorganic Materials. (President : Professor E. Suenson, Denmark ; Vice-President : Direktor P. K. van der Wallen, Holland). (1) Concrete and Reinforced Concrete. (2) Erosion and Corrosion of Natural and Artificial Stone. (3) Methods of Testing Ceramic Bodies.

Group C.—Organic Materials. (President : Dr.-Ing. R. Barta, Czechoslovakia ; Vice-President : Professor Roos-af-Hjelmsäter, Sweden). (1) Textiles. (2) Wood Cellulose. (3) Timber Preservation. (4) Ageing of Organic Materials. (5) Colours and Varnishes.

Group D.—Subjects of General Importance. (President : M. H. Rabozée, Belgium ; Vice-President : Professor Dr. M. Ros, Switzerland). (1) Relation between the results of laboratory tests and behaviour in use and service. (2) The bearing of recent advances in physics and chemistry on the knowledge of materials. (3) The properties of materials for the thermal and acoustic insulation of buildings.

In addition to the technical sessions of the Congress, numerous visits to places of scientific and industrial interest will be arranged, as well as excursions and social functions, including a banquet, a dance and official receptions. Special arrangements will be made for the entertainment of ladies.

All requests for further information and enquiries should be addressed to the Honorary Secretary of the Congress, Mr. K. Headlam-Morley, at the offices of the British Committee, The International Association for Testing Materials, 28 Victoria Street, London, S.W.1.

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

PROCEEDINGS OF THE SOCIETY

CANTOR LECTURES

NUTRITION AND NATIONAL HEALTH

By Major-General Sir Robert McCarrison, C.I.E., M.D., D.Sc., LL.D., F.R.C.P.

Lecture I.—*Delivered February 10th,* 1936.

FOOD, NUTRITION AND HEALTH

When I accepted the invitation of the Royal Society of Arts to deliver the Cantor Lectures—an invitation by which I was greatly honoured—it was my intention to speak on the more general aspects of nutrition in relation to public health. But during the time that has elapsed since then I have seen, heard and read much both in the lay Press and elsewhere which leads me to believe that the significance of the term, "nutrition," is not always fully understood. It has seemed to me desirable, therefore, to attempt an explanation of it; for if its meaning be clearly comprehended, its importance to the national health will become self-evident. This explanation must of necessity deal with fundamentals, familiar possibly to many of you. But there may be others of my audience, or who may read these lectures in their published form, whose understanding of nutrition is less complete: to these I especially address myself.

It is not possible to comprehend the relationship of food to nutrition, and of both to health and disease without some understanding of the structure of the body, of the functions of food, of the processes involved in the function of nutrition and of the pathological changes brought about in the organs and tissues of the body by derangements of nutrition consequent on faulty food.

The Cell

The human body, like the bodies of all plants and animals, excepting those of a very lowly order, is made up of countless millions of cells. Each cell is composed of a microscopic mass of protoplasm enclosed in a delicate membrane and having a differentiated part—the nucleus. Every cell is a perfect physico-chemical laboratory, doing specialised work and needing special materials, both for this work and for the maintenance of its structure and functions. The protoplasm, or essential substance of living cells, is the physical basis of organic life. Upon it depend all the vital functions: nutrition, secretion, growth, reproduction, irritability and motility. It is subject to change or differentiation of the most varied sort: forming epithelium, bone, muscle, nerves, glands, organs of special sense, etc. It is a viscid colloidal material made up of water (hydrogen and oxygen), carbon, nitrogen and a number of other elements in complex and unstable combinations. The nitrogenous substances, known as proteins, enter largely into its structure, as do a number of inorganic salts. In addition to these, the cells contain another indispensable component: a phosphorised fat called lecithin. This substance facilitates the absorption of nutriment by the cell, the discharge of such specific products as it may contribute to the processes of the body as a whole, and the elimination of the end-products of its chemical activities.

The nucleus is the directing centre of the functional activity of the cell. It consists of a network of filaments whose meshes are filled with a special kind of protein containing phosphorus (nucleo-protein). Along the course of these filaments there are granules formed of an iron-containing protein (chromatin). Upon the integrity of the nucleus and the normal structure of its proteins depend all the vital processes. Presently we shall see how important the specific proteins of the nucleus are, how important are the mineral elements—phosphorus and iron—entering into their composition, how important is the optimum supply to the cells of all elements and complexes needed for cellular activity. For the root of the whole matter of food and nutrition is the nourishment of the cell, whether it be of bone, epithelium, muscle, gland, nerve or special sense. The inevitable consequence of its faulty nourishment is depreciation of its structure and functions —the foundation upon which a vast edifice of disease is built.

Food

Man is made up of what he eats. The constituents of his food are those of which his body is composed. His foodstuffs, derived from the vegetable and the animal kingdoms, consist, for the most part, of matter that is living, that was formerly living or that is derived from matter that was formerly living. Man cannot himself build up living tissue from materials which have in themselves no necessary connection with living protoplasm. This, plants do for him. Out of the earth and air, and under the influence of the sun, they transmute certain inorganic substances—mineral salts, water and carbon dioxide—into organic foodstuffs suited to his use and to the use of the animals whose produce or whose

flesh he uses as food. He is, indeed, created out of the earth; and according as the earth provides, by way of plant and animal life, the materials needed by his body, so is that body well, ill or indifferently made and sustained.

Food may be defined as anything which when taken into the alimentary tract provides on digestion materials for the nourishment of the body: materials wherewith its cells fashion themselves each after its kind; materials to sustain their structure and to co-ordinate and control their functions; materials wherewith tissues of specialised functions elaborate their products; and, materials to provide energy for cellular work.

The substances wherewith these purposes are effected are oxygen, water and the digestion products of proteins, fats, carbohydrates, inorganic elements and vitamins. Apart from oxygen and water, those at present known to be indispensable to the performance of the body's functions are thirty-six in number. Of these eighteen are amino-acids, derived from the proteins of the food. Eleven are inorganic elements: sodium, potassium, calcium, magnesium, phosphorus, iron, copper, sulphur, manganese, chlorine and iodine. One is glucose, derived chiefly from carbohydrates (though the body can in certain circumstances convert proteins and fats into glucose). One is linoleic acid, derived from fats. And five are vitamins: called respectively vitamins A, B, C, D and E.

No single foodstuff contains all these essentials. A properly constituted diet is such a combination of foodstuffs as does provide them all in proper quantity and proportion one to another. Their proportion, or balance, is a matter of great importance. We may, indeed, conceive of a properly constituted diet as a system of mutually adapted parts working together; absence or inadequacy of one part deranging the whole system. It may be said of the essential constituents of food, as Marcus Aurelius has said of other things: "Meditate often upon the connection of these things and upon the mutual relation that they have one unto another. For all are, after a sort, folded and involved one within another and by these means all agree well together."

In addition to proteins, carbohydrates, fats, mineral salts and vitamins, there are in food blood-forming substances, extractives, flavouring matter and pigments that have parts of greater or lesser importance to play in the nourishment of the body. The food must also contain a certain amount of innocuous, indigestible material, or roughage as it is called, to stimulate intestinal movements. Besides all this, there is something in the freshness of food, especially vegetable food—some form of energy perhaps; it may be certain rays of light or electrical property—which gives to it a health-promoting influence. Certain it is that no synthetic diet that I have been able to devise has equalled in health-sustaining qualities one composed of the fresh foodstuffs as nature provides them.

Further, the quality of vegetable foods depends on the manner of their cultivation: on conditions of soil, manure, rainfall, irrigation. Thus, we found in India that foodstuffs grown on soil manured with farmyard manure were of higher nutritive quality than those grown on the same soil when manured with chemical

manure. Rice grown in standing water—the common practice in India—was less nutritious than when grown on the same soil under conditions of natural rainfall. Spinach grown in a well-tended and manured kitchen-garden was richer in vitamin C than that grown in an ill-tended and inadequately manured one. Examples of this kind might be multiplied, but these suffice to indicate ways in which agricultural practice is linked with the quality of food, with nutrition and with health. If, indeed, man is to derive all the benefits that the soil is so ready to yield to him, he must employ his intelligence and his knowledge in rendering it fit to yield them to him. Impoverishment of the soil leads to a whole train of evils: pasture of poor quality; poor quality of the stock raised upon it; poor quality of the foodstuffs they provide for man; poor quality of the vegetable foods that he cultivates for himself; and, faulty nutrition with resultant disease in both man and beast. Out of the earth are we and the plants and animals that feed us created, and to the earth we must return the things whereof we and they are made if it is to yield again foods of a quality suited to our needs. This truth is beautifully expressed by Robert Bridges when he says:

> "From Universal Mind the first-born atoms draw
> their function, whose rich chemistry the plants transmute
> to make organic life, whereon animals feed
> to fashion sight and sense and give service to man,
> who sprung from them is conscient in his last-degree
> of ministry unto God, the Universal Mind,
> whither all effect returneth whence it first began."

Nutrition

Nutrition is the act or process—it is, in fact, the series of co-ordinated processes —whereby the nourishment of the body is effected. It consists in the taking-in and assimilation through chemical changes (metabolism) of materials with which the tissues of the body are built up and their waste repaired, by which the processes of the body are regulated, from which energy is liberated for the work the body has to do, and heat generated for the maintenance of its temperature. Nutrition is thus a fundamental function of the body. By the activity proper to it the structural integrity and functional efficiency of every cell is maintained. This, indeed, is its primary purpose; for if the mechanism of the body be perfect, and continue in perfection, it may be trusted to produce the energy needed for its work provided it be constantly supplied with suitable fuel. It is the mechanism that matters; the fuel (or Calories) is merely a question of the energy the body expends in the maintenance of vital processes—respiration, circulation, secretion, etc.— and in external (muscular) work.

The processes involved in the function of nutrition are mastication, deglutition, digestion, absorption, circulation, assimilation and excretion; the last including perspiration, exhalation, urinary excretion and defæcation. There are thus three stages in nutrition: the first, effected in and by the alimentary tract; the second, in or by the cells composing the body; and, the third by the organs of excretory function—skin, lungs, kidneys and bowel. It is of the utmost importance to realise

that not only is the activity proper to the function of nutrition dependent on the efficient performance of all these acts, but their efficient performance is dependent on the adequate nourishment and functional efficiency of the organs and tissues performing them.

At this point, and to maintain the sequence of our story, reference might be made to the implications of these acts : mastication, digestion, absorption, assimilation, and so on. But it may be enough to remind you that they include the ordered operation of involuntary muscular action, the production of various digestive and other juices, the elaboration of ferments or enzymes, and of catalytic agents needed for the speeding-up of chemical processes, the production of blood-forming substances, the interchange of body fluids, the transport of nutrients to the remotest recesses of the body, the removal of end-products of chemical action and of waste products from the body and many other vital processes ; all of which are influenced favourably or unfavourably by the constitution of the food. The alimentary tract and the organs (including the teeth) associated with it are of particular importance in this connection. They form a highly specialised mechanism designed for the nourishment of the body. The efficiency of the function of nutrition depends primarily on the functional efficiency of this mechanism and this, in its turn, on the constitution of the food.

Let me here draw your attention to some of the tasks which this mechanism has to perform. It splits up, by digestion, the foodstuffs in such a way that the essential nutrients are readily absorbed and made available to the cells in forms best suited to their use. Thus, the many and differing kinds of proteins, present in the plant and animal tissues we use as food, are all decomposed into fragments: the amino-acids to which previous reference has been made. From these fragments, on their absorption, the body builds up the proteins suited to it and to its different parts ; for each part its special kind. Mark then, how important it is that the ingested proteins are of kinds that will furnish all the fragments needed. Similarly, the many kinds of carbohydrates—starches, sugars, cellulose—in food are all converted into glucose which is the chief fuel needed for the production of energy, muscular work and the maintenance of the temperature of the body. Likewise, the many kinds of fats, each containing different fatty acids, are converted by digestive processes into soluble soaps which pass readily through the intestinal wall and in their passage are re-converted into the fats needed by the body. The mineral ingredients of food are not only made available for use by the body but the intestinal canal itself regulates to a considerable extent their absorption and excretion. Each part of this mechanism has its own contribution to make to the furtherance of the function of nutrition. Thus, the stomach, in normal conditions, not only produces the acid and enzymes needed for gastric digestion but, by its normal contractions, it sustains the appetite for food. It produces, too, a substance which, by its combination with a material or materials of unknown nature contained in certain foodstuffs, gives rise to a product having the specific property of ensuring the normal formation of the red cells of the blood. Absence of one or other of

the component parts of this product—that produced in the stomach or that provided in certain foodstuffs—leads to the occurrence of pernicious anæmia. This product is stored in the liver for use as required by the bone-marrow—the birthplace of the red blood cells—hence the use of liver extract for the cure of this disease. The stomach produces yet another substance which is necessary for the normal nutrition of the central nervous system. Thus early in the process of digestion is the welfare of these two most important tissues—blood and nerve—taken care of, and by the stomach.

Beyond the stomach, in the duodenum, there are glands that not only secrete digestive juices but some that produce protective substances lest the acid contents of the stomach should, after they leave it, erode the mucous membrane of the bowel. The continued production of these alkaline and other protective substances is an important factor in the prevention of duodenal ulcer; and the continued functional efficiency of the glandular cells producing them is dependent on the quality of the food. There is no stage in the whole process of digestion, absorption and passage of the gastro-intestinal contents along their appointed way which is not regulated and controlled by some substance or substances derived from food. Even the time-table of events, which normally proceeds with clockwork regularity, is under such control. It cannot be too insistently stated that disturbance of these processes, disturbance of this time-table, and alterations in form or consistency of the fæcal residues are signs that something is going wrong or has gone wrong with the function of nutrition.

The alimentary tract is very prone to suffer both structurally and functionally in consequence of faulty food and to become the prey of pathogenic agents of disease or the harbourer of parasites. Further, states of ill-health of this tract often provide conditions precedent to the development of diseases of faulty nutrition. In such circumstances essential constituents of food may not be absorbed in sufficient quantity for the needs of the body or for those of certain communities of cells, and disease due to their deficiency may arise. Many years ago (1918), when the newer knowledge of nutrition was in its infancy, I obtained some dozens of healthy monkeys from the jungles of Madras. Some I fed on faulty and ill-balanced food deficient in vitamins and mineral elements, others on perfectly constituted food. The latter remained in good health; the former developed gastro-intestinal ailments, ranging from gastritis and ulcer to colitis and dysentery, while one amongst them had a commencing cancer of the stomach. The passage of years has not dimmed the recollection of this crucial experiment nor detracted from the far-reaching importance of the results yielded by it. Indeed, there is, perhaps, no more significant fact in regard to the function of nutrition than that this highly specialised alimentary mechanism on which the nourishment of the body depends is itself amongst the most susceptible of the structures of the body to faulty nutrition.

Nutrition is affected adversely by a number of factors: imperfect oxygenation of the blood and tissues, as from faulty breathing, lack of fresh air, bad ventilation,

over-crowding and lack of exercise ; insufficient rest and want of sleep ; over-work and fatigue ; worry and emotional excitement ; lack of sunshine ; insufficient calories for the work the body has to do ; excessive consumption of alcohol ; indigestible food ; gastro-intestinal disorder ; and, many conditions of ill-health. But by far the most important factor is food of improper constitution. The determination of the constitution of the food is the first essential in the assessment of the efficiency or lack of efficiency of the function of nutrition ; the correction of food-faults is the first essential in the restoration of this function to normal.

Disorder of the function of nutrition, brought about by faulty food, causes the body to react in a variety of ways, depending on the nature of the food-faults that give rise to it, the part or parts of the body effected by it and the intervention or the non-intervention of toxic or microbic agents of disease. These reactions, involving as they do disturbance in structure or in functions of various parts of the body, manifest themselves as sub-normal states of health or as actual disease in great variety of form.

It will be realised from these considerations how far-reaching are the aspects of nutrition. They include the chemistry of food, the chemical changes (metabolism) whereby the function of nutrition is effected, the activity of the various organs and tissues in response to food conditions, the structural and functional changes induced in organs and tissues by faulty food, and the conditions of the body that result from faulty nutrition. Nutrition touches upon, indeed embraces in its compass, many sub-divisions of biology—bio-chemistry, bio-physics, morphology, physiology, pathology and medicine. Knowledge of it helps to bridge the gulf between physiology and pathology—a gulf in need of bridging—it is, indeed, an essential foundation of rational medicine.

Nutrition is commonly spoken of as a condition of body—excellent, normal or sub-normal, as the case may be—when, in truth it is a function of the body on which condition of body—*i.e.*, health—depends. For a proper comprehension of nutrition and of the processes involved in it this distinction has to be borne in mind. Such terms as *under-nutrition* and *malnutrition* are now-a-days in common use, often without a clear conception of their meaning. Sometimes they are used to signify a condition of body which *under-nourished* would more fittingly describe ; sometimes to signify *under-feeding*. "Malnutrition," we are reminded by Fowler in his *Modern English Usage*, "is a term to be avoided as often as under-feeding will do the work"; for malnutrition is not merely under-feeding but disorder of the processes of nutrition brought about, as a rule, by the habitual use of food of improper quality.

Nutrition is, also, commonly defined as "food," "nourishment," "that which nourishes." But, as we have just seen, it is something much more than this. Food is the instrument, nutrition is the act of using it. To employ the term "nutrition" as an alternative one for "food" is to miss its true meaning, to fail in comprehending not only that in which nutrition consists, but all that is meant by its derangements.

HEALTH

Health is variously defined as " soundness of body," " state of bodily or mental well-being," " freedom from disease, disorder, pain or weakness." It is, in fact, a variable condition of body as in good, bad, poor or ill health. At its best it is " that state of being in which all the parts and organs are sound and in proper condition ; that condition of the body and its various parts and functions which conduces to efficient and prolonged life. It implies, moreover, the ability to produce and rear offspring fitted to live and efficiently to perform the ordinary functions of their species"*. This optimum state of being can be attained when—but only when—the animal organism is adequately nourished. Further, it is possible to produce at will in animals under experimental conditions every grade of health—good, bad or indifferent—by alterations in the composition of their diets. Specific diseases of many kinds can be produced by feeding them on diets having specific food-faults or prevented by the correction of these faults. The interaction of faulty food, faulty nutrition and microbic or toxic agents leads to the spontaneous appearance of many others or to their controlled appearance at the will of the experimenter. I know of nothing so potent in maintaining good health in laboratory animals as perfectly constituted food ; I know of nothing so potent in producing ill-health as improperly constituted food. This, too, is the experience of stock-breeders. Is man an exception to a rule so universally applicable to the higher animals ? It seems most unlikely that he can be, although it is to be recognised that his requirements for adequate nutrition, and the effects upon him of deficiencies of various food-essentials, are not necessarily the same as in animals. Indeed, these effects are known to differ in different species of animals. Nevertheless, the principles of nutrition are fundamentally the same in man and in animals. It may, therefore, be taken as a law of life, infringement of which will surely bring its own penalties, that the greatest single factor in the acquisition and maintenance of good health is perfectly constituted food. It is this thesis that I have to sustain in these lectures.

THE EXPERIMENTAL METHOD IN RESEARCH ON NUTRITION

As you are probably aware, it is customary in the investigation of nutritional problems in the laboratory to use the experimental method and to feed animals —rats, as a rule—on synthetic diets composed of purified food-materials, but lacking this or that essential according to the nature of the inquiry in hand. The results of such experiments, though of great value in the ascertainment of the function of a given essential of food, and in the precise determination of the bio-chemical and pathological changes resulting from its want, are open to the objections that the observations made in rats are not necessarily applicable to human beings, that synthetic diets such as are used in these experiments are never eaten by human beings, that human diets are rarely or never wholly lacking in

* Century Dictionary.

any single food-essential, that their deficiencies are usually multiple, and, that the diets of mankind are often unbalanced in other regards, such, for instance, as in their high content of carbohydrates relative to other food-essentials. The validity of these objections cannot be gainsaid ; nevertheless, it may be remarked in passing that the frequency with which results observed in rats are applicable to man is remarkable—a fact which will be the better appreciated from the examples I am about to place before you. Further, without such experiments on animals the vast amount of knowledge revealed by them within recent years would, for the most part, be hidden from us, and we would still be in ignorance of the kind of consequences to expect in man from his continued use of food of faulty constitution. We would, moreover, be in ignorance of what a properly constituted diet is.

But when in such investigations, diets composed of food-materials in common use by man or diets in actual use by human beings are used in the feeding of our animals, most of these objections do not arise, and the results observed have a more direct application to man, provided the faulty combinations of the food-materials entering into the diets are such as uninstructed man himself commonly employs. It has seemed to me necessary, therefore, to use in my experimental work diets composed of the actual materials that human beings eat ; and it is with such diets that most of my work has been done.

Before giving examples of the effects of such faulty diets on the animal organism, let me draw your attention to the relation of the national diets of India to the physical efficiency of the races using them.

Food and Physical Efficiency

Nowhere in the world is the profound effect of food on physical efficiency more strikingly exemplified than in India. As you know, India has some 350 million inhabitants, made up of many races presenting great diversity in their characteristics, manner of life, customs, religion, food and food-habits. The tribes of the Indian Frontier, and of Himalayan regions, the Peoples of the Plains—Sikhs, Rajputs, Mahrattas, Bengalis, Ooriyas, Madrassis, Kanarese and many others —exhibit, in general, the greatest diversity of physique. And as each race is wedded to its own manner of living, to its own national diet, comparison between them is easy.

The level of physical efficiency of Indian races is, above all else, a matter of food. No other single factor—race, climate, endemic disease, etc.—has so profound an influence on their physique, and on their capacity to sustain arduous labour and prolonged muscular exertion. " As we pass from the North-West region of the Punjab down the Gangetic Plain to the Coast of Bengal, there is a gradual fall in the stature, body-weight, stamina and efficiency of the people. In accordance with this decline in manly characteristics it is of the utmost significance that there is an accompanying gradual fall in the nutritive value of the dietaries." So wrote McCay, as a result of his investigations, a quarter of a century ago. My own observations have served to confirm his conclusions, though I find other causes

in addition to protein-insufficiency—to which he attached chief importance—for the decline he refers to. This decline extends also to the peoples of the South and West of India, being especially apparent in certain parts of the Madras Presidency. This is not to say that in these parts there are not many people of good physique nor that in the North of India there are not many whose physique is poor. But speaking of the generality of the people it is true that the physique of Northern races of India is strikingly superior to that of the Southern, Eastern and Western races (Fig. 1). This difference depends almost entirely on the gradually diminishing value of the food, from the north to the east, south and west of India, with respect to the amount and quality of its proteins, the quality of the cereal grains forming the staple article of the diet, the quality and quantity of the fats, the mineral and vitamin contents, and the balance of the food as a whole. In addition to these questions of quality there is the further one of quantity. In regard to the latter little need be said; for it is obvious that if a man is not getting enough to eat he cannot be physically efficient. Unfortunately, the numbers in India who do not get enough to eat may be counted by the hundred thousand.

In general the races of Northern India are wheat-eaters, though they make use also of certain other whole cereal grains. Now the biological value of the proteins of whole wheat is relatively high; and the wheat is eaten whole, after being freshly ground into a coarse flour (*atta*) and made into cakes called *chapattis*. It thus preserves all the nutrients with which Nature has endowed it, particularly its proteins, its vitamins and its mineral salts. The second most important ingredient of their diet is milk, and the products of milk (clarified butter or ghee, curds, buttermilk); the third is *dhal* (pulse); the fourth, vegetables and fruit. Some eat meat sparingly, if at all; others, such as the Pathans, use it in considerable quantity. Their food thus contains—when they can get the food they want, which they do not always do—all elements and complexes needed for normal nutrition (with the possible exception of iodine in some Himalayan regions) and abundance of those things that matter from the point of view of the structural and functional efficiency of the body. In conformity with the constitution of their dietaries they are the finest races of India, so far as physique is concerned, and amongst the finest races of mankind. Familiar as I am with the chapatti-fed races of Northern India, I have little patience with those who would have us believe that "white flour" is as good an article of diet as "whole wheat flour." White flour, when used as the staple article of diet, places its users on the same level as the rice-eaters of the south and east of India. They are faced with the same problem; they start to build up their dietaries with a staple of relatively low nutritive value. If their health and physical fitness are not to suffer, they must spend more money on supplementary articles of diet in order to make good the deficiencies of white flour than if they had begun to build on the surer foundation of whole wheat flour (Fig. 2). So it is with rice, which is the staple article of diet of about ninety millions of India's inhabitants. The rice—a relatively poor cereal at best—is subjected to a number of processes before use by the consumer; all of which reduce—some to a dangerous degree—its already

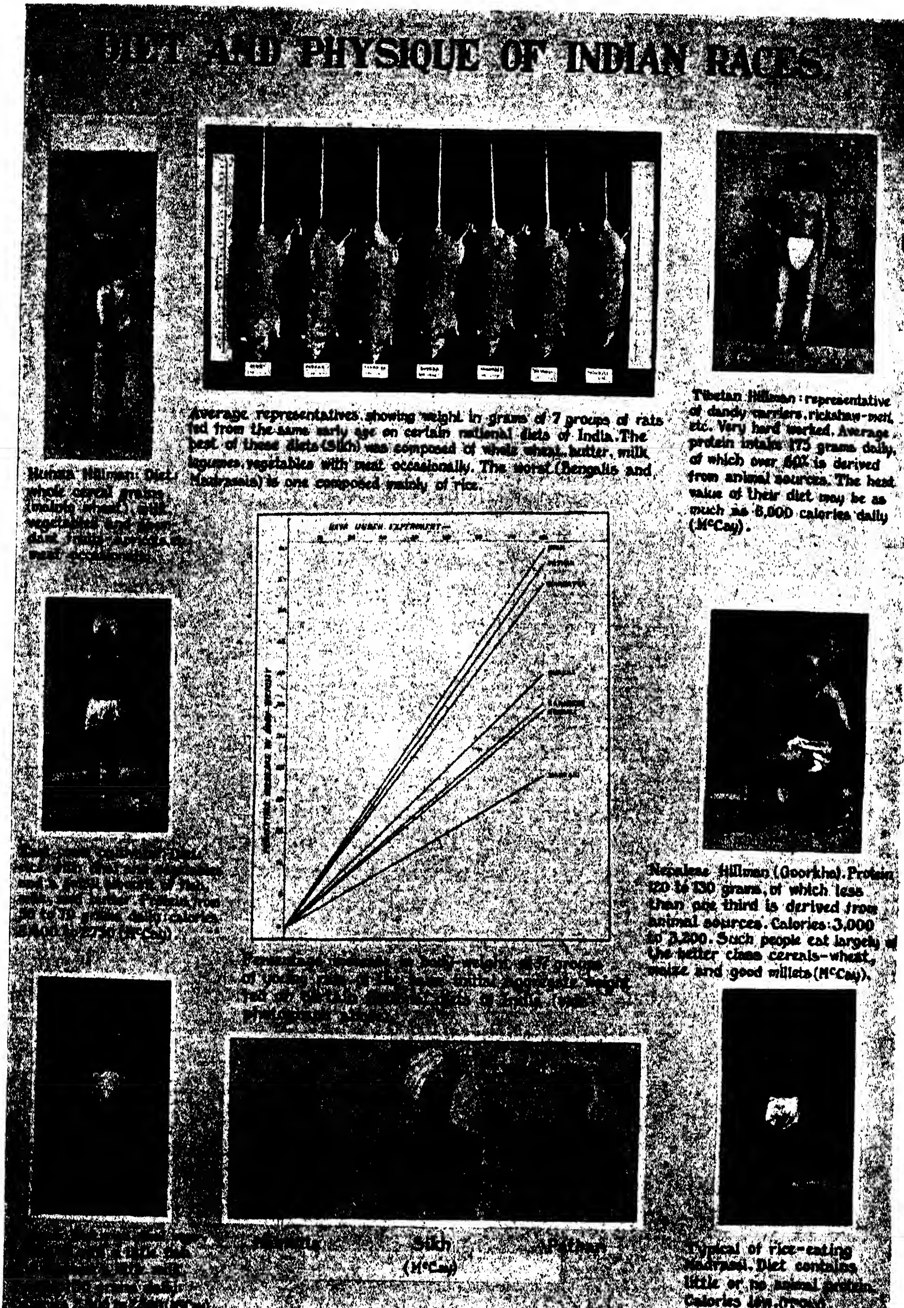


FIG. 1. NOTE FINE PHYSIQUE OF RACES (MAHRATTA, SIKH, PATHAN) WHOSE DIETS ARE WELL CONSTITUTED, AND POOR PHYSIQUE OF THOSE (BENGALI, MADRASSI) WHOSE DIETS ARE ILL-CONSTITUTED. NOTE SIMILAR EFFECT IN RATS FED ON THESE DIETS. FROM LEFT TO RIGHT THE RATS REPRESENT SIKH, PATHAN, MAHRATTA, GOORKHA, KANARESE, BENGALI, MADRASSI.

sparse supply of certain essential nutrients. It is parboiled, milled or polished; often all three. It is washed in many changes of water and, finally, it is boiled. It is thus deprived of much of its proteins and mineral salts and of almost, but not, all its vitamins. Add to this that the average Bengali or Madrassi uses relatively little milk or milk-products, that by religion he is often a non-meat-eater, that his consumption of protein, whether of vegetable or of animal origin, is, in general, very low, that fresh vegetable and fruit enter into his dietary but sparingly, and we have not far to seek for the poor physique that, in general, characterizes him. In short, it may be said that according as the quality of the diet diminishes with respect to proteins, fats, minerals and vitamins, so do physical efficiency and health; a rule which applies with equal force to the European as to the Indian.

Relative Values of National Diets of India

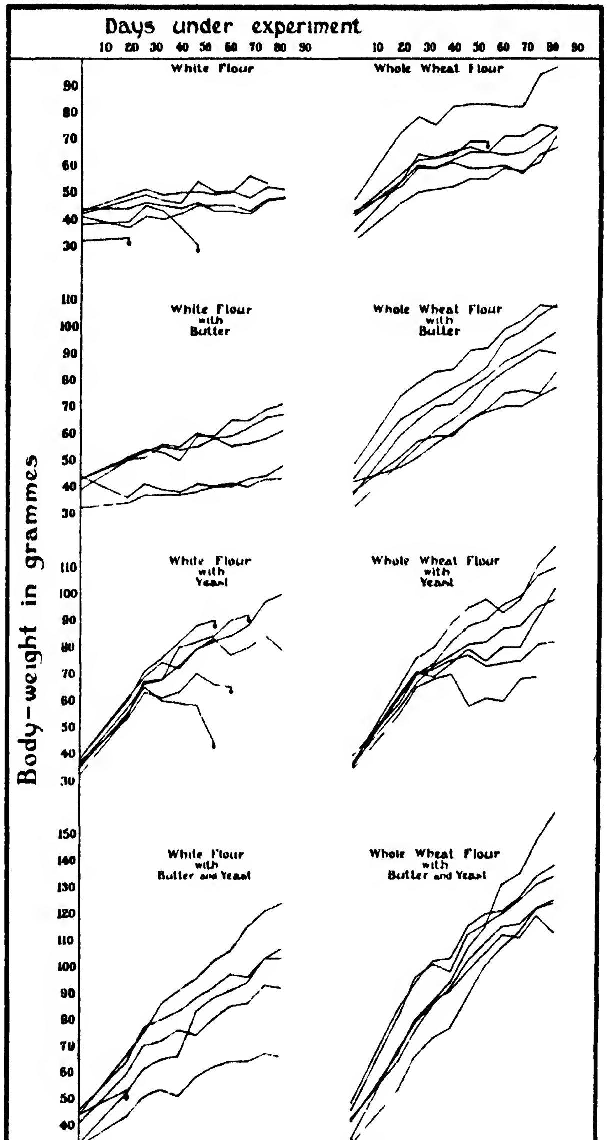
This truth will probably be best appreciated by a reference to an experiment carried out in my laboratory some years ago, with the object of determining the relative values of certain national diets of India: Albino rats were employed in this test. The cycle of development in the rat takes place about thirty times as quickly as in man, so that the experiment about to be described, which lasted 140 days, would correspond to the observation of human beings, under the same experimental conditions, for a period of nearly twelve years. Seven groups of twenty young rats, of the same age, sex-distribution and body-weight, were confined in large, roomy cages under precisely similar conditions of life. To one group the diet, as prepared and cooked by the Sikhs, was given; to another that of the Pathans; to a third that of the Maharattas; and so on through Goorkhas, Bengalis, and Kanarese to Madrassis. The results on the eightieth day of the experiment are shown in Fig. 1; from which it will be seen that the various diets ranged themselves in the following descending order of nutritive value: Sikh, Pathan, Maharatta, Goorkha, Kanarese, Bengali and Madrassi. At the end of 140 days the animals in each group were weighed and an average taken of their aggregate weight. The rat which conformed most closely to the average for its particular group was photographed side by side with the average rats from other groups. The photograph shown in Fig. 1 is the result. From it we see that it conforms to the results of observations made in man himself. In brief, the best diet—that of the Sikhs—contains in abundance every element and complex needed for normal nutrition; the worst diet—that of the Madrassi—has many faults; it is excessively rich in carbohydrates, and deficient in suitable protein, mineral salts and vitamins. Presently we shall see that this difference in the nutritive value of these diets is reflected in the diseases from which the people of the north and south of India suffer.

Freedom of Well-Fed Animals from Disease

So impressed was I by the adequacy of the northern Indian's diet that during the later years of my experimental work I used it as the stock diet of my rats. Their

WHITE FLOUR VERSUS WHOLE WHEAT FLOUR.

The arrows indicate day of death (usually from pneumonia).



Note high mortality in rats fed on white flour diets 80% as compared with 4% in those fed on whole wheat flour diets

Showing individual weight curves of young rats fed on white flour or whole wheat flour alone or in combination with butter or yeast or both.

FIG. 2.

food consisted of *chapattis* lightly smeared with fresh butter, sprouted Bengal *gram* (pulse), *raw, fresh* vegetables (cabbage and carrots) *ad libitum*, milk, the hard crusts of bread (to keep their teeth in order), a small ration of meat with bone once a week, and water. The average daily strength of the stock rats so fed was about 1,000. They were kept in stock for about two years—a period approximately equal to the first fifty years in the life of a human being—the young being taken as required for experimental purposes, and the remainder used for breeding. During the five years prior to my leaving India there was in this stock no case of illness, no death from natural causes, no maternal mortality, no infantile mortality. It is true that the hygienic conditions under which they lived were ideal, that they were comfortably bedded in clean straw, that they enjoyed daily exposures to the sun practically the whole year round, and that the care bestowed upon them was great; but the same care was bestowed during these years on several thousand deficiently-fed rats, which developed a wide variety of ailments (*vide infra*) while the well-fed animals enjoyed a remarkable freedom from disease. It is clear, therefore, that it was to their food that this freedom was due. If man himself did not provide in his own person the proof that a diet composed of whole cereal grains, or a mixture of cereal grains, milk, milk-products, pulses and vegetables, with meat occasionally, sufficed for optimum physical efficiency, this experience in rats would do so. It is not, therefore unreasonable to conclude that if by minute attention to three things—cleanliness, comfort and food—it is possible to exclude disease from a colony of cloistered rats, it is possible greatly to reduce its incidence by the same means in human beings and to produce a race whose physique is as nearly perfect as nature intended it to be.

Supposing now we cut out the milk component of this diet or reduce it to a minimum, we find that disease soon begins to make its appearance, especially if at the same time we limit the consumption of fresh vegetable foods. I have repeatedly made these restrictions with the result that respiratory diseases, gastro-intestinal diseases and maladies consequent on degenerative changes in mucous membranes and other structures of the body become frequent. It is apparent, therefore, that the diet of the Sikhs is only health-promoting so long as it is consumed in its entirety. Indeed, we know that those of this race who, for whatever reason, do not consume adequate quantities of milk, milk products and fresh vegetables, do not long retain the fine physique for which the Sikhs are famous. These food-materials are for them and in their own parlance, *takatwar khurak* (foods that give strength), which we now-a-days speak of as " the protective foods," since they make good the deficiencies of muscle meat, refined cereals, etc., which enter so largely into the diets of western peoples.

Before leaving this experience, let me emphasize two things: the first, that all things needful for adequate nourishment of the body and for physical efficiency are present in whole cereal grains, milk, milk-products, legumes, root and leafy vegetables and fruits, with egg or meat occasionally. What is eaten besides these is more a matter of taste than of necessity. And the second: that the diet must be

complete in every essential. It is not to be expected that by substituting, for instance, wholemeal bread for white bread, health will benefit greatly unless the substitution completely restores the balance of an ill-balanced diet; nor that by adding bottled vitamins or mineral elements to a faulty diet its faults will be remedied, unless they be confined to vitamins or mineral elements. The correction of food faults lies first in their computation and thereafter in the construction of a diet so balanced and complete as to satisfy all physiological needs. Fortunately, the layman need not concern himself with such computations, though in institutions they may be necessary. It suffices for him to know that in whole cereal grains, milk, milk products, eggs and fresh vegetables he has foods that, when used in adequate quantities, will maintain the structural integrity and functional efficiency of his body.

A Good Diet and a Bad One: A Comparative Study

Consider now another experiment, also in rats (Fig. 3). Two identical groups, twenty in each, from the above-mentioned stock were used in it. They were housed in colonies: both in large cages of the same dimensions (5 feet by 3 feet by 1·5 feet). One group was fed on the stock diet to which I have referred above; the other on a diet such as is commonly used by the poorer classes in England. The latter diet consisted of white bread, margarine, over-sweetened tea with a little milk (of which the rats consumed large quantities), boiled cabbage and boiled potato, tinned meat and tinned jam of the cheaper sorts. It has many faults, of which vitamin and mineral deficiencies are the chief. The first thing one noticed, as this experiment progressed, was that the members of the former, and well-fed, group lived happily together. They increased in weight and flourished. One died from accidental causes; two others died from pneumonia (the experiment precluded the provision of the usual straw for bedding since rats are apt to nibble it, the nights were cold and always when a large number of rats are kept in the same cage there are some that do not get their fair share of milk; these facts are probably sufficient to account for the occurrence of pneumonia in two cases). The other group did not increase in weight; their growth was stunted; they were badly proportioned; their coats were staring and lacking in gloss; they were nervous and apt to bite the attendants; they lived unhappily together and by the sixtieth day of the experiment they began to kill and eat the weaker ones amongst them. When they had disposed of three in this way I was compelled to segregate the remainder. The experiment was continued for 190 days or for a period which would correspond to about sixteen years in man. The survivors in both groups were then killed and subjected to careful post-mortem examination. The outstanding differences in the incidence of disease in the two groups were these. Polyneuritis, a sure indication of deficiency of vitamin B_1 in the diet, did not occur in the group fed on the Sikh diet, while two cases occurred in the group fed on the poorer class Britisher's diet. Disease of the lungs (neither group was supplied with bedding, the factor of cold operated equally in both) was twice as common in the latter group. Gastro-intestinal disease

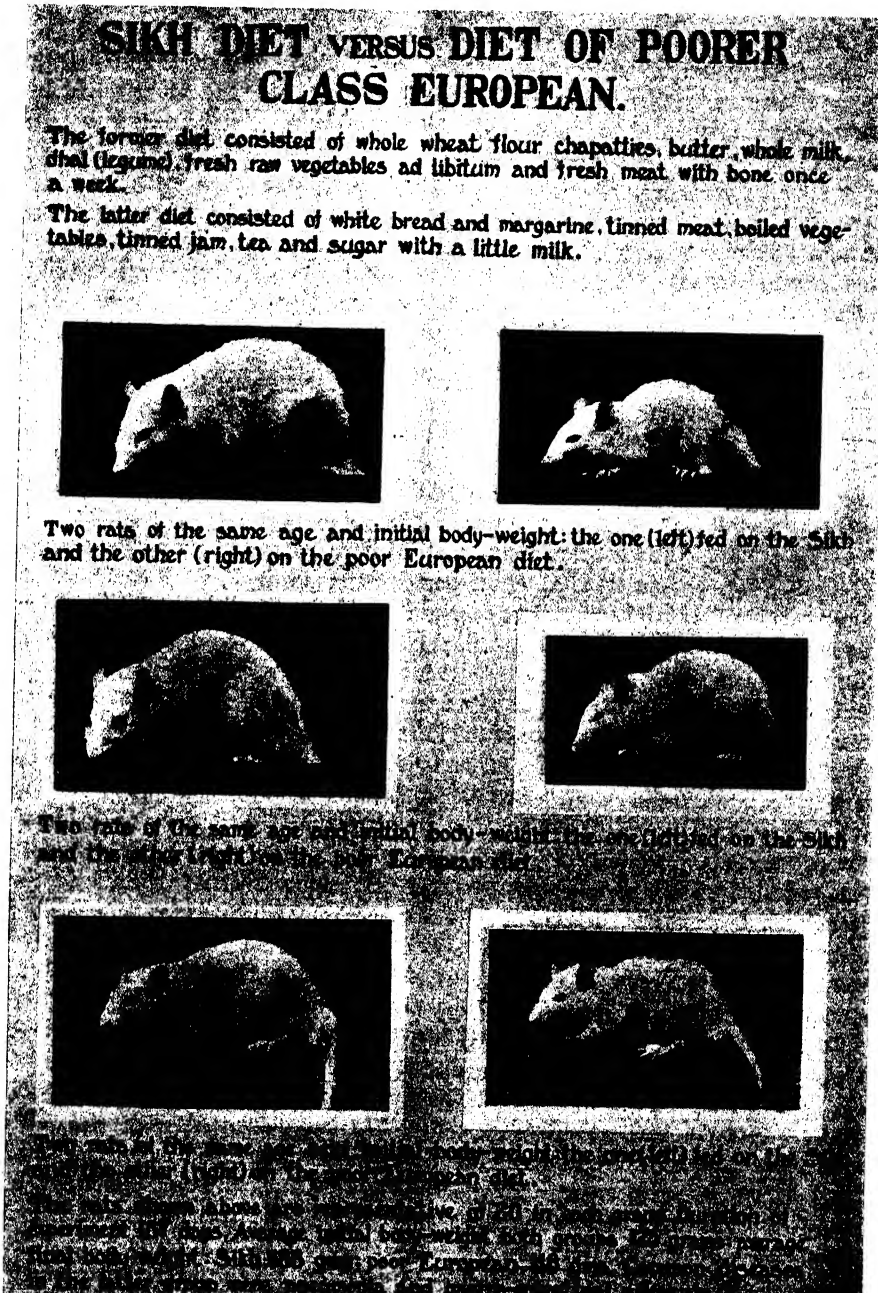

SIKH DIET VERSUS DIET OF POORER CLASS EUROPEAN.
The former diet consisted of whole wheat flour chapatties, butter, whole milk, dhal (legume), fresh raw vegetables ad libitum and fresh meat with bone once a week.
The latter diet consisted of white bread and margarine, tinned meat, boiled vegetables, tinned jam, tea and sugar with a little milk.
Two rats of the same age and initial body-weight: the one (left) fed on the Sikh and the other (right) on the poor European diet.

FIG. 3.

(gastric ulcer, warty outgrowths of epithilium in the stomach, gastritis, enteritis and colitis) was very frequent in this group, while that receiving the Sikh diet was free from it. Indeed, the animals fed on the poorer class Britisher's diet fared little or no better than those, in another experiment, that were fed on a diet in common use in Madras, and the maladies from which they suffered were much the same. The results of this experiment indicated clearly that a diet, such as is commonly used by the poorer classes in England, gives rise in rats to two chief classes of ailment—pulmonary and gastro-intestinal—while a more perfectly constituted diet, such as is commonly used by Northern Indian races, affords a considerable measure of protection against both. It is not unreasonable, therefore, to expect that, other things being equal, similar results will arise in man from the use of these diets. We do, in fact, find that these two classes of ailment are amongst the most frequent of the maladies afflicting the poorer class Britisher (Fig. 5) as well as the poorer class Madrassi.

Food and Peptic Ulcer

Another example may be provided by peptic ulcer (gastric and duodenal). This malady is very common in the south of India, rare in the north. It is, in fact, fifty-eight times more common in the latter part of India; it is particularly so in Travancore. In order to determine whether or not it was related in its genesis to diet the following experiment was undertaken. Three groups of young rats, from the healthy stock above referred to, were fed as follows: one on the well-constituted diet as used by the Sikhs, but reinforced with additional milk; one on the carbohydrate-rich, protein-poor, vitamin-poor and mineral-poor diet in common use by the poorer class Madrassi; and the third on the diet—largely made up of tapioca—in common use by the poorer classes in Travancore, amongst whom peptic ulcer is so common. This diet has many faults, of which protein, mineral and vitamin deficiencies are the chief. The experiment was continued for close on 700 days; a period which would correspond to about fifty years in man. Many animals in the last two groups died during its course, from the usual respiratory and gastro-intestinal diseases. The results revealed at post-mortem examination of all the animals were, as far as peptic ulcer was concerned, as follows: first group (Sikh diet), nil; second group (Madrassi diet), 11 per cent.; third group (Travancore diet), 29 per cent. incidence of peptic ulcer.

Here, again, we see that a disease common in certain parts of India (as it is in this country) can be produced in rats by feeding them on the faulty diets in common use by the people of these parts, while other animals, fed on a perfectly constituted diet in common use by human beings, amongst whom peptic ulcer is rare, remain free from it. Surely, if we are to place any reliance on animal experiments of this kind, we must regard faulty and ill-balanced food as a cause of gastric and duodenal ulcer in human beings? How it causes it, whether by direct or indirect action or want of action, or because of want of this or that essential of food or excess of this or that one, is a matter of little consequence—though of much scientific interest. What is of consequence, not only to the people of India, but, I venture to affirm, to

the people of this country, is that by the continued use of a perfectly constituted diet they are unlikely to develop gastric or duodenal ulcer.

EXPERIMENTAL BERI-BERI AND " STONE "

Examples of this kind, occurring in my own experience, might be multiplied to an extent that would occupy many hours in their narration. I must, therefore, limit their numbers. Two more will suffice: As no doubt you all know there is a disease called beri-beri, which is prevalent in certain parts of the Tropics, chiefly amongst rice-eaters. It is not prevalent amongst rice-eaters in other parts of India, nor is it so prevalent in its endemic homes as a comparatively recent broadcast by the B.B.C. may have led some of you to suppose: every other woman in the south of India does *not* suffer from beri-beri. About forty years ago Eijkman noticed that if fowls were fed on an exclusive diet of polished rice they developed a type of polyneuritis which had certain likenesses to beri-beri—a malady in which polyneuritis is a prominent symptom. He found, moreover, that they did not develop this " nutritional polyneuritis "—as he rightly called it—when they were fed on unpolished rice or on polished rice to which the rice-polishings were added. So he, and his colleague, Grijns, concluded that there was something—vitamin B_1, as it ultimately proved to be—in the rice-polishings which prevented the nutritional polyneuritis in birds, a something that might possibly prevent beri-beri in man, as indeed it (vitamin B_1) is now known to do. But to prevent is one thing; to cause, if the preventive be removed, is, or may be, another. It is now-a-days an almost universal belief that on a diet of polished rice or on a diet devoid of vitamin B_1, beri-beri develops after a few months. Theoretically, this is possible, in practice it is a rare occurrence. For no one, even in localities where beri-beri is endemic, ever does live on an exclusive diet of polished rice or on a diet devoid of vitamin B_1; always the diet contains some of this factor, however little that may be. Further, only a relatively small proportion of persons subsisting on diets deficient in vitamin B_1 do develop beri-beri, even in endemic areas of the disease. If one feeds pigeons on a diet almost devoid of this vitamin they develop polyneuritis, but polyneuritis is only one of the symptoms of human beri-beri; there are two others, equally important—grave disorder of the heart and œdema. Now supposing one does, as I have often done, feed pigeons on diets similar to those in actual use by human sufferers from beri-beri, then we find that a disease having all the pathological characters of true beri-beri does develop in a proportion of the birds, just as it does in a proportion of human beings. But this diet is not devoid of vitamin B_1, although it is low in it. It does not contain enough of it to prevent the disease, or enough of some other factor in addition to vitamin B_1, to prevent the development of the complete syndrome, or, alternatively, to prevent the development or operation of the ultimate causal agents of the malady. Now if in such a diet one substitutes whole wheat flour for a part of the rice and at the same time we add to it fresh vegetables, such as tomatoes, then the disease does not arise, either in birds or in man. I have, myself, so prevented human beri-beri in a certain jail in the East

where it was wont to break out year after year ; and many others, since the days of Takaki—who first prevented it in the Japanese Navy as long ago as 1882—have by similar means prevented it. This is another example of the control that the use, in animal experiments, of human diets may exercise over results reached by the use of a single component of them, such as polished rice.

We have seen that if rats be fed on the perfectly constituted diet of the Sikhs they remain in good health : they do not, for instance, develop stone in the urinary tract. But if one removes from this diet the milk and milk products and cuts down the fresh vegetable foods to a minimum, then many of them do develop this condition. They develop also a wide variety of other ailments, but it is with " stone " that I am here concerned. If we replace the milk or butter they do not develop this condition. This is an observation of great importance to the wheat-eating races of northern India, amongst whom " stone " is so common. For it is precisely these articles of diet—milk, milk products and fresh vegetables—which the poorer classes amongst them have to cut out when times are hard. There are, no doubt, other factors concerned in the causation of " stone " ; but the broad fact remains that a perfectly constituted diet rich in milk, milk products and fresh vegetable foods affords a high degree of protection against it.

Variety of Disease in Improperly Fed Animals

I have mentioned the freedom from disease enjoyed by well-fed and hygienically housed albino rats. During the last eighteen years of my experimental work in India I used many thousands of animals—rats, pigeons, fowls, rabbits, guinea-pigs and monkeys—feeding them on diets not synthetically prepared from purified foodstuffs but from foodstuffs in common use by the people of India ; my purpose, as previously hinted, being to learn what relation the food used by the people had to the diseases from which they suffered. At the risk of being tedious I shall now enumerate the maladies I have encountered in these improperly-fed animals, leaving out of count such manifestations of ill-health as weakness, lassitude, irritability and the like, which are commonly met with in malnourished animals. Here is the list. *Skin diseases :* loss of hair, gangrene of the feet and tail, dermititis, ulcers, abscesses, œdema. *Diseases of the eye :* conjunctivitis, corneal ulceration, xerophthalmia, panophthalmitis, cataract. *Diseases of the ear :* otitis media, pus in the middle ear. *Diseases of the nose :* rhinitis, sinusitis. *Diseases of the lungs and respiratory passages :* adenoids, pneumonia, broncho-pneumonia, bronchiectasis, pyothorax, pleurisy, hæmothorax. *Diseases of the alimentary tract :* dental disease, dilatation of the stomach, gastric ulcer, epithelial new growths in the stomach (two cases of cancer), duodenal ulcer, duodenitis, enteritis, colitis, intussusception and a condition of the lower bowel suggestive of a pre-cancerous state. *Diseases of the urinary tract :* pyonephrosis, hydronephrosis, pyelitis, renal calculus, nephritis, uretheral calculus, dilated ureters, vesical calculus, cystitis, incrusted cystitis. *Diseases of the reproductive system :* endometritis, ovaritis, death of the fœtus *in utero*, premature birth, uterine hæmorrhage, testicular disease. *Diseases of the*

blood : anæmia, a pernicious type of anæmia, *Bartonella muris* anæmia. *Diseases of the lymph and other glands :* cysts, abscesses, enlarged glands. *Disease of the endocrine glands :* goitre, lymph-adenoid goitre, adrenal hypertrophy, atrophy of the thymus, hæmorrhagic pancreatitis (very occasionally), *Diseases of the heart :* cardiac atrophy, cardiac hypertrophy, myocarditis, pericarditis, hydropericardium. *Diseases of the nervous system :* polyneuritis, beri-beri, degenerative lesions. *Diseases of the bone :* crooked spine, distorted vertebræ (no work was done on rickets—a known " deficiency disease "). *General diseases :* malnutritional œdema, scurvy, prescorbutic states.

All these conditions of body, these states of ill-health, had a common causation : faulty nutrition, with or without infection. They are the clinical evidence—the signs and symptoms—of the structural and functional changes in organs or parts of the body that result directly or indirectly from faulty nutrition. It will be noted that local infections and maladies of a chronic and degenerative kind are conspicuous amongst them. These maladies are, in short, the symptoms of malnutrition as observed in animals fed on faulty diets—some of them admittedly very faulty—in use by human beings, or on food-materials in use by them. It is reasonable, then, to expect that maladies of a similar order are likely to result from malnutrition in human beings. In my next lecture I shall endeavour to make clear how it is that food of improper constitution leads to that disturbance of structure or function of organs or parts of the body which is " disease."

NOTES ON BOOKS

THE USE OF VEGETABLE DYES FOR BEGINNERS. By Violetta Thurston. Leicester : The Dryad Press. 1*s*. 6*d*.

In her introduction Miss Thurston is at pains to make no claims for vegetable dyes that cannot be substantiated. The chemical dyes, she says, are less troublesome, quicker, faster and cheaper than the vegetable. The latter have just one property to recommend them : they are more *beautiful.*

However, as recently as 1927 the author of the Victoria and Albert handbook of carpet weaving was saying of dyes that " there is good promise that the synthetic products will eventually rival the natural in quality." Perhaps " eventually " is not yet, in spite of Miss Thurston's honourable disclaimer.

This little book begins with a key to the recipes for colours which follow the pages of general instructions. By far the greater number of dye plants are indigenous in England, the important indigo being one of the exceptions. The dye-house is described, with a shelf for the mordants well out of the reach of children. After a practical account of mordanting and dyeing come hints of how and when plants are to be collected. To deal with plants is to deal with living and indeed capricious organisms. " Thus a plant in the north of England may produce a better dye than the same plant in the south, and *vice versa.* The same plant may give a different shade of colour if gathered at different periods of the year."

The excellent arrangement of the book is completed with a bibliography and index.

P. B.

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PROCEEDINGS OF THE SOCIETY

CANTOR LECTURES

NUTRITION AND NATIONAL HEALTH

By MAJOR-GENERAL SIR ROBERT McCARRISON, C.I.E., M.D., D.Sc., LL.D., F.R.C.P.

LECTURE II.—*Delivered February 17th*, 1936

RELATION OF CERTAIN FOOD ESSENTIALS TO STRUCTURE AND FUNCTIONS OF THE BODY

In my first lecture I confined myself to the more general aspects of the relation of food to nutrition and of both to health and disease. To-day I propose to deal in more detail with those essentials that are needed for the efficient construction and maintenance of the fabric of the body and for the regulation of its processes. It is necessary to be aware of the different parts these substances have to play in nutrition and of the effects of their inadequate supply or inadequate utilisation when supplied in sufficient quantities. For then only can it be understood how such inadequacy leads to that disturbance of structure or function of organs or parts of the body which is " disease."

These essentials are proteins, mineral elements and vitamins. But before dealing with them something must be said of oxygen and water.

OXYGEN AND WATER

Strictly speaking both oxygen and water are to be regarded as foods, for of all the supplies on which the cells of the body are dependent they are the chief.

The continued and unhampered supply of *oxygen*—available in the air we

breathe—is, as you know, essential to the continued activities of the body. Respiration depends upon it; tissue-respiration as well as respiration in its commonly understood sense. So also does combustion, both of organic materials ingested as food and of certain substances that result from cellular activity. By its means the latent chemical energy of food is converted into other forms of energy for the work—both internal and external—of the body, and the waste products of that work are burned up and disposed of. Thus, the non-volatile substance—lactic acid—produced during muscular work, is burned to the volatile carbonic acid which is carried away by the blood and exhaled through the lungs. Without the adequate supply of oxygen the body would become clogged by the accumulation of waste. It is not possible here to discuss the manifold activities of oxygen in the body nor, indeed, is it necessary to do so. It suffices to emphasise the great importance of the efficient oxygenation of the tissues in maintaining the efficiency of the function of nutrition. The proper ventilation of the lungs and the proper exercise of the body are obvious means to this end. These means are complemental to the use of properly constituted food on which, also, the adequate supply of oxygen to the tissues depends.

Water is of outstanding importance to the body, both from the point of view of structure and of function. It is the most abundant constituent of living cells. Its presence therein permits of changes in their form and of their return to their original form after alteration by movements; rapid displacements of substance and the mobility of living matter are thus rendered possible. Its conservation of the boundaries of cells and their restoration after displacements due to motion conserve in their turn the minute internal structure of cells.

Although about two-thirds of the fabric of the body are made up of water, it is not present in all tissues in the same amount. Fatty tissue and bone contain less, the grey matter of the brain, glandular organs and muscle contain more, and the body fluids (blood, etc.) most. The percentage of water is highest in those tissues wherein chemical changes are most rapid, and in tissues that are called upon to function most frequently. The great importance of an adequate supply of water for infants and growing children, in whom metabolic processes are most active, is thus made evident.

Water is the solvent of most of the constituents of protoplasm; it is the vehicle that transports nutrients to the cells, the medium wherein all chemical changes take place within them and the solvent wherein the end-products of these chemical changes are discharged from the body. The evaporation of water from the lungs and skin is one of the chief factors in the regulation of body temperature. It has, too, various mechanical functions such as in facilitating the movements of mobile parts (for example, joint surfaces and coils of intestine) one upon another. The functional efficiency of the digestive tract, the normal production of the digestive juices, the normal absorption of food and the normal action of the bowels may be cited as conspicuous examples of the need of the body for an adequate supply of water.

Water is constantly being discharged from the body by way of the skin (perspiration), lungs (exhalation), kidneys (urination) and bowel (defaecation). This loss is partly replaced by the water contained in solid food and by that produced in the chemical reactions of metabolism. But over and above this more than a quart, as such or in beverages, is needed daily to make good the loss. The need of the cells and tissues for water is expressed in that indefinite sensation which we call "thirst." The first rule in dietetics is to drink water in abundance.

The insufficient ingestion of water gives rise to headache, loss of appetite, disturbance of digestive functions and of the action of the bowels, nervousness and impaired capacity for work, mental or physical. In infants the loss of water consequent on diarrhœa, vomiting or excessive evaporation from the lungs may cause serious symptoms: failure of digestive processes consequent on diminished production of the digestive juices, rapid loss of weight, dry skin, exhaustion, coma and convulsions.

PROTEINS

Proteins are the next most abundant constituents of living cells. Their chief role in the body is to provide materials for its growth and for the repair of its tissues. There is a constant utilisation of proteins in these ways, a continual voiding of the waste products of their metabolism. Their continuous supply is, therefore, necessary; and this supply must be of the right kind, to furnish the requisite amino-acids from which the tissues of various parts of the body are built up. Besides their function as providers of building-materials they also furnish a certain amount of energy. They are the source from which the body elaborates certain enzymes, or ferments, such as those concerned in the digestive processes, and catalytic agents—glutothione, thyroxine, adrenaline and insulin—needed for the speeding up of chemical processes.

The daily requirements of the body for proteins are approximately 1·0 gramme per kilogramme of normal body-weight; more than this is an undesirable excess. Sources of them amongst animal foods are milk, meat, glandular organs, eggs and fish; and amongst vegetable foods, legumes, whole cereal grains, seeds, nuts and green vegetables. Those derived from animal sources are, in general, more suited to the needs of the human body than those derived from vegetable sources. The former are, in consequence, sometimes spoken of as "good," "suitable" or "first-class" protein, and the latter as "second-class" protein. But it is not necessary that the protein requirements of the body should be derived chiefly from animal sources; it suffices if one-third of them be so derived. Nor is it necessary that "good" protein be derived from "meat." Those of milk are amongst the best of all proteins and well able "to leaven the whole lump" of those derived from vegetable foods. For this reason, amongst others, presently to be referred to, the use of milk and cheese as articles of diet, should be greatly extended. Much greater use should also be made of the better class vegetable proteins, such as those of soya bean, legumes and nuts, and much less use of the

flesh of animals. Apart from every other consideration the use of meat as the main source of proteins is as uneconomical as it is unnecessary; but where flavour is there will desire be also.

It will be obvious from these considerations that the insufficient ingestion, absorption or assimilation of proteins, or of proteins of the right kind, will tend to degradation of vital processes; a degradation manifested in stunting of growth, poor physique, lack of energy, resource and initiative, digestive disturbances and impaired action of glandular organs. To these there may be added a lowered resistance to infection. Severe degrees of protein-starvation, associated as they often are with want of food in general, may give rise to a condition known as "malnutritional œdema," "war œdema" or "famine œdema," in which the body, in part or in whole, becomes water-logged.

MINERAL SALTS

The mineral constituents of food consist of some twenty elements of which eleven—previously enumerated (Lecture I)—are definitely known to be essential to vital processes. They are all intimately related one to another by complex chemical combinations and interactions, so that it is difficult to separate the functions of one from those of another. In general these functions are to provide building-materials for the fabric, and to regulate various functions, of the body. In fulfilment of the first function some enter into the composition of all cells while others form the major part of the skeleton and teeth. In fulfilment of their regulating functions they have various parts to play: all are concerned in controlling the normal exchanges of body-fluids and the permeability of the cell membranes; some maintain and regulate the neutrality of the blood, others the normal contractility of muscles and excitability of nerves; some enter into the composition of the digestive juices; others take part in the transport of oxygen from the lungs to the tissues and of carbon dioxide from the tissues to the lungs, thus making oxidation processes possible. Indeed, it may be said that the more the mineral constituents of food are studied, the more important is their role in nutrition found to be. It is essential to remember this importance in view of the prominence which now-a-days is given to vitamins—the one class of substances is as important as the other.

Mineral substances are continually being lost by the body by way of the excretions, and their replacement is constantly necessary. Thus, in certain circumstances, the loss of salt may be excessive and give rise, if not replaced, to distressing symptoms. Herbivorous animals, and those human beings whose food is vegetarian, require more salt than carnivora or flesh-eaters.

From the point of view of dietary construction, four of these mineral elements —calcium, phosphorus, iron and iodine—are of outstanding importance; not only because of their own functions but because they are those most likely to be present in the average diet in insufficient quantities. In constructing diets the amounts of these minerals should be adjusted with the same care as is given to those of proteins, carbohydrates, fats and vitamins; and, in estimating the quantities of

essential components in any diet, the calculations should always include these four elements. By making provision for their ample supply no serious deficiency of any other mineral essential is likely to arise.

Calcium.—Calcium is one of the most important, as well as most widespread, of all constituents of the body. It is a chief constituent of the bones and of the teeth. It controls the contractility of muscle including that of involuntary muscles such as those of the gastro-intestinal tract. The rhythmic beat of the heart depends to a great extent upon it, as do the movements of cilia (*vide infra*). It maintains the normal response of the nerves to stimuli, preventing their hyper-irritability, preserves the clotting power of the blood, and sustains the capillary circulation. It co-ordinates the activities of certain other mineral elements.

Calcium is made use of in the body to the extent of about 0·68 gramme daily; but to allow a fair margin for waste and non-absorption the food should provide at least a gramme a day. The allowance for expectant mothers and for growing children should be even greater. The growth of the bones and teeth as well as of the body generally, menstruation, pregnancy and lactation make special demands for its abundant supply, more especially in western countries where sunshine is scanty and the intake of vitamin D—a substance controlling the absorption and utilisation of calcium—is low.

The insufficient supply of calcium in the food is one of the commonest of all food-faults in this country. Indeed, it is difficult for the growing child, under modern conditions of life and food-supply, to obtain enough calcium unless the diet contains at least a pint of milk a day—milk being a rich source of it. This is another cogent reason for the greater use of milk as an article of diet. The diet of pregnant women is often dangerously low in calcium. Recent researches in America have shown that such women need 1·6 grammes daily: often they do not receive more than one-half of this amount. Its deficiency leads to the imperfect building of bones and teeth, in growing children to rickets and all its attendant consequences, to mal-formation or mal-alignment of the vertebræ and spinal curvature, and to decay of teeth. To satisfy the urgent demands for this important element elsewhere it may be withdrawn from the bones—its storehouse in the body. Not infrequently the normal calcium-content of the blood, on which so many bodily activities rely, is being maintained at the expense of decalcification elsewhere—of teeth, alveoli and bones. The clinical expressions of such decalcification are softening of bone, weakness of bone, increased liability to fractures, retraction of the alveoli in which the teeth are set and dental decay. Want of calcium leads also to nervous excitability and to a condition known as tetany, to impaired muscular activity, both of voluntary and of involuntary muscles, and to disturbance of cardiac rhythm and of the neutrality of the blood; it may also be a cause of chilblains and of irritability of the skin. Foods rich in calcium are milk, cheese, turnip-top greens, black treacle, almonds, watercress, egg yolk, peas, beans and green leafy vegetables of various kinds.

Phosphorus.—Phosphorus is an essential component of the nuclei of all cells.

It, therefore, plays a conspicuous part in all cellular activities. It enters largely into the composition of the bones and teeth, and is needed for the manufacture of the lipins which abound in all tissues, and more especially in the nervous tissues. It should be provided in the diet to the extent of about 1·5 gramme daily—alike for women and children as for men—and for the same reasons as for the abundant supply of calcium. During pregnancy the amount should be increased, according to recent findings, to as much as 2 grammes daily.

Deficiency of phosphorus may lead to stunting of growth, poor bone formation, softening of bone, a certain type of rickets, tooth decay, disturbance of the normal neutrality of the blood and to depression of vital processes generally. Foods rich in phosphorus are cheese, egg-yolk, lean meat, almonds, nuts, whole wheat, liver, milk, fresh beans, spinach, brussels sprouts and potatoes.

Iron.—Iron is an essential constituent of the nuclei of all cells, and as such it is concerned in the control of all cellular activities. It is an essential constituent of the red pigment—hæmoglobin—of the blood. Hæmoglobin is the carrier of oxygen from the lungs to the tissue-cells ; it is obvious, therefore, that iron in this, if in no other capacity, plays a vital part in the economy of the body. The daily loss of iron is from 7 to 8 milligrammes by way of the fæces and about 1 milligramme by way of the kidneys. In all there are lost about 10 milligrammes daily, or about one-three hundredth part of the total hæmoglobin-iron in the body. It has been estimated that the iron-content of the average diet in this country is rarely more than 10 milligrammes, while it is frequently as low as five. In these circumstances, ill-health is likely to arise. This takes the form of anæmia, which, as is now known, is a common ailment, especially in infants and in women of the child-bearing period of life ; in the former, because of the paucity of iron in the mother's or in cow's milk ; in the latter, because of its insufficient ingestion or assimilation.

The diet should contain at least 15 milligrammes of iron daily. During pregnancy this amount ought to be increased to 20 milligrammes. Foods rich in iron are lentils, egg-yolk, liver, beans, black treacle, oatmeal, whole wheat, turnip tops, spinach, prunes, dates and raisins. It is to be noted that milk is poor in iron. Nature compensates to some extent for this defect in milk by bringing the child into the world with a fair store of iron in its own tissues ; but this store does not always protect the infant from anæmia when the mother's milk is poor in iron or when the child is fed on cow's milk.

Iodine.—Iodine is an essential constituent of the thyroid gland—its chief store-house in the body—and of the active principle of the gland, thyroxine. It is necessary for the normal functional activity of this important organ whose action is to the oxidation processes of the body not unlike that of the bellows to the fire—thyroxine speeds up the rate of these processes. In normal circumstances, the daily requirements of iodine are about 50 *gamma* (1/1000th of a milligramme). Growing children, pregnant and lactating women, need more of it than others. More also is needed when the diet is rich in fats or contains an excess of lime, and more in some conditions of insanitation, of infection as of the intestinal tract and,

indeed, of infections generally. Its deficiency in the diet admits of the operation of certain agents causing goitre: a malady likely to give rise to cretinism, deaf-mutism and idiocy in the offspring of goitrous women. Foods rich in iodine are sea-foods, cod-liver oil, eggs, goat's milk (in India), millet, fresh vegetables and some condiments such as cloves, ginger and black pepper.

Other important mineral elements are magnesium, copper, chlorine, fluorine and sulphur. The first has important physiological functions, particularly in relation to the movements of body-fluids. The second is invariably present in the brain and has a relation to the blood, being complemental to iron in the prevention of anæmia. The third (chlorine) plays a leading part in the alkali chlorides of the blood and tissues and in the hydrochloric acid of the gastric juice. The fourth (fluorine) is a normal constituent of bones and teeth ; it is not devoid of significance in the formation of these tissues. The fifth (sulphur) in the form of the complex amino-acid, cystine, is essential for growth, is a constituent of certain catalytic agents, and has a relation to the nutrition of joints.

It is commonly believed that if the foodstuffs of which a diet is composed be varied enough, there is little likelihood of deficiency of any important mineral elements. This is no doubt true ; but the variety is often not sufficiently great nor of a kind to ensure an adequate supply of them. In this connection I quote the following from the *British Medical Journal* of December 29th, 1934 : " The average diet in this country contains from 5 to 10 mg. of iron." It is apparent, therefore, that the average diet is not varied enough to provide a sufficiency of this most important element, nor is it always varied enough to provide a sufficient amount of lime. The truth is that the common belief—safety in variety—is likely to be misleading ; for, as McCollum showed years ago, one can ring the changes on a great variety of foodstuffs—muscle meats, cereal grains, tubers, roots, potatoes, peas and beans—and yet have failure of nutrition unless the diet contains a sufficiency of the protective foods—milk, and green leafy vegetables. This applies to vitamins as well as to mineral elements.

The Vitamins

The vitamins, according to present knowledge, are of five classes, designated by the letters of the alphabet : A, B, C, D and E. Each has its own part to play in nutrition—a part that cannot be taken by any other.

Vitamin A.—Vitamin A is essential to growth and development of the young and " to the orderly progression of nutritional processes at all ages " (Sherman). It is essential to the young in the way that without a sufficient supply of it pathological states are likely to arise and to interfere with growth and development. It is a promoter of vigour and stamina, and plays a part in maintaining the structure and function of the nervous system. It is one of the most important of the food-essentials concerned in the efficiency of the function of reproduction and the rearing of the young ; hence the importance of its adequate supply to pregnant and nursing women. It is a potent factor in maintaining the resistance of the

body to infection. This it effects by its specific relation to epithelia throughout the body : that of the skin, of the mucous membranes (particularly of the respiratory and the alimentary tracts), of the glands of external secretion and their ducts, of the thyroid, the interior of the eye, the lungs, the kidneys, the bladder and all passages leading to the exterior of the body. Its deficiency gives rise to structural changes in epithelium which impair its functions and lower the local defences against infection. In this sense, and in this sense only, it is anti-infective. Diminished resistance to local infection may be the first evidence of its deficiency, and the pathological state resulting therefrom the first clinical evidence that nutrition is at fault. Much more of it is needed for the prevention of infection than for growth. Let me draw your attention to the kind of change that is brought about in epithelium by lack of this vitamin. [A picture showing in cross-section the mucous membrane of the upper respiratory passage of a rat was here exhibited.] This membrane is covered by tall epithelial cells, each of which has a fringe of cilia. A function of these cells is to secrete mucus which not only traps bacteria but permits the cilia to perform their movements—this they can only do when the membrane they fringe is moist and the moisture contains calcium. The function of the cilia is, by their rapid movements in waves, to propel bacteria or foreign particles, as of dust, towards the exterior of the body, whence, in normal circumstances, they are ejected. It has been estimated that the cilia move at the rate of about 600 times a minute. Now when the food is deficient in vitamin A the cilia slough off and the cells themselves lose their secretory character, becoming horny or keratinised, as it is called. Figure to yourselves what this means : no longer is this trapping, this propelling of harmful particles, whether of dust or bacteria or both, possible in the areas so affected. For, unless the deficiency be very grave, it is only at certain places that these changes occur. Where they do occur the local defences are broken down and bacteria are free to implant themselves in the soil thus made ready for them and to invade the tissues. And it is a curious fact that, in these circumstances, bacteria that may otherwise exist as harmless saprophytes often take on pathogenic properties and become disease-producing. Mark how serious a view the body takes of these events : at once it sends up defence forces in the form of round cells to man the breach, and these may accumulate to such an extent as actually to form adenoid-like outgrowths.

The maladies resulting from deficiency of vitamin A are, with the exception of night-blindness, usually the result of superimposed infection. They involve, singly or in combination, many systems of the body : ocular, nervous, cutaneous, buccal, dental, gastro-intestinal, urinary and reproductive. Such diverse conditions as xerophthalmia, night-blindness, colitis, stomatitis, gastric ulcer, one form of goitre and stone-in-the-bladder may arise in consequence of its inadequate supply in the food of rats. Some of these conditions, such as xerophthalmia, night-blindness, stomatitis, catarrhs of all sorts, urinary calculus and certain skin affections are definitely known to occur also in man from this cause ; and, for my own part, I do not doubt but that the future will reveal a number of others that

are due also to this cause in man : disease of the respiratory and gastro-intestinal tracts in particular. It is to be emphasised that many of the local maladies brought about by deficiency of this vitamin are often, because of the local infection associated with it, not readily curable by the provision of the vitamin ; the reason no doubt being that pathogenic organisms, once they have taken root, are difficult to eradicate, especially in parts of the body where structural and functional changes have taken place. The fact that the administration of the vitamin by the mouth may not cure a certain condition is, therefore, no sufficient reason for the supposition that its deficiency may not have been a cause of it. Sub-optimum supply of vitamin A may be associated with no clinical signs of disease, depending on the degree of the deficiency, the age of the subject and the absence of infection. It may, indeed, be only by the sense of well-being, resulting from its more abundant provision, that its sub-optimum supply becomes apparent. As Sherman says of it : " Its bountiful supply is a bulwark against disease of many kinds, a promoter of vigour, stamina, and that condition of body and its various parts and functions which conduces to efficient and prolonged life."

Rich sources of Vitamin A or of its precursor (carotene) are animal fats, cod-liver-oil, milk, butter, liver, eggs, herrings, carrots and fresh, green vegetables.

Vitamin B.—Vitamin B is a complex, said to consist of some six or seven fractions, each having its own particular function. Their separation is largely a laboratory manœuvre—a feat rarely indulged in by Nature, though some foodstuffs contain more of one fraction of the complex than of others. It is enough for the layman to know what are the chief functions of two of its principal parts : vitamin B_1 and vitamin B_2 (the latter itself a complex). Both are essential for growth (Fig. 4) ; one (B_1) is destroyed by heat ; the other (B_2) is not.

Vitamin B_1 is intimately concerned with the maintenance of neuro-muscular efficiency throughout the body ; such, for instance, as that of the stomach, the colon and the heart. Within an hour of the administration of a dose of the International Standard Preparation of the vitamin to a person whose diet is low in this factor, but who may show no obvious sign of its lowness, the heart's action is markedly improved and remains so for approximately four hours, when the good effect wears off. If, however, the same dose be given to a person whose diet contains enough of it, no effect on the heart is observable on electro-cardiographic examination. In animals (pigeons and rats), under experimental conditions, its deficiency gives rise to marked slowing of the heart's action (bradycardia) amounting sometimes to " heart-block." It causes also a slowing down of respiration and a fall in body-temperature and in blood-pressure. Its deficiency has a specific effect on the adrenal glands (causing them to undergo hypertrophy) and through them, as well as more directly, on the sympathetic nervous system. Appetite is dependent, in great measure, on an adequate supply of it—appetite for water as well as for food. It has an important influence on the secretory activity of the stomach ; its deficiency greatly impairing the production of gastric juices. In its absence or inadequate

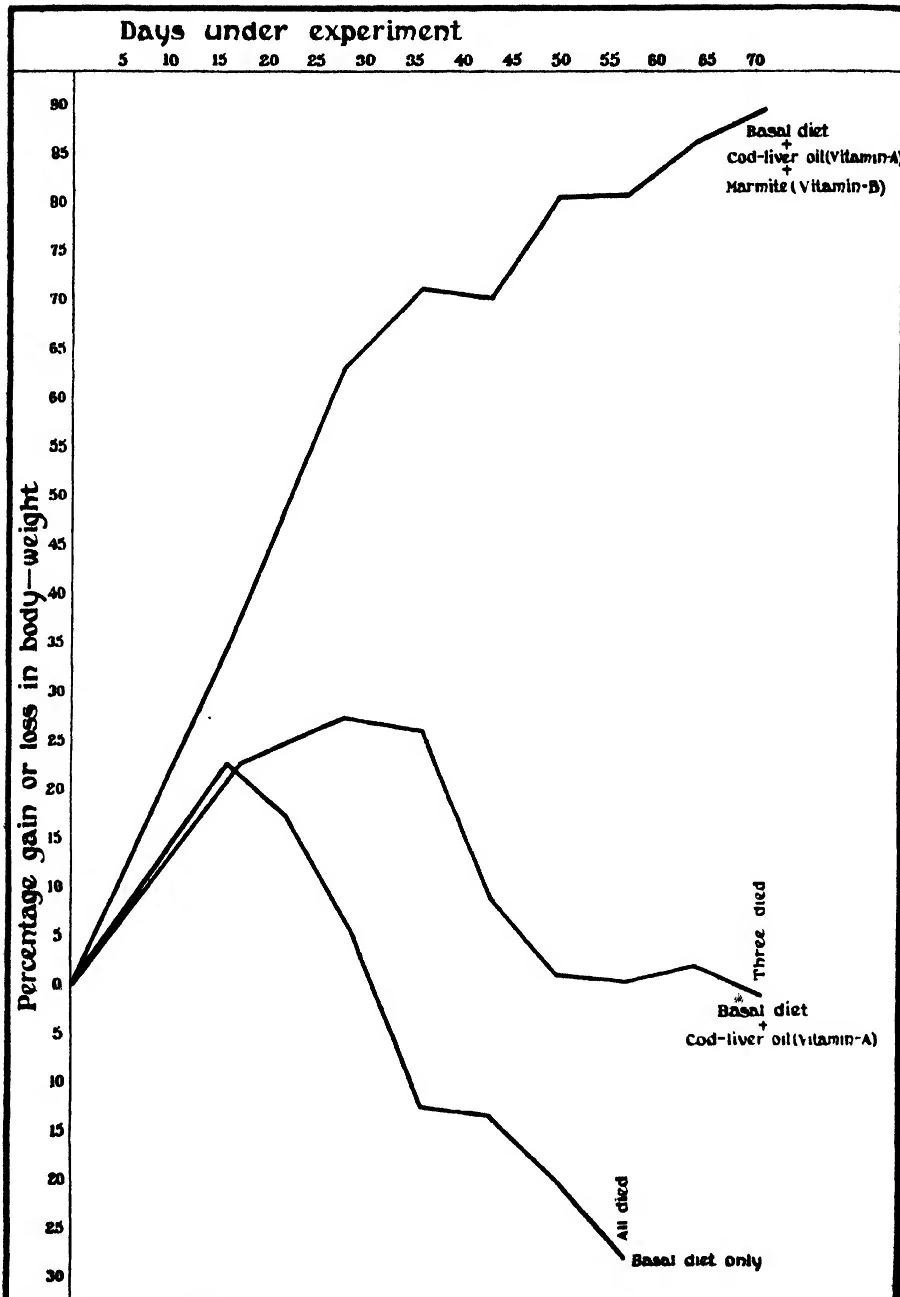

FIG. 4. EFFECT ON THE GROWTH OF YOUNG RATS OF WANT OF CERTAIN VITAMINS.

supply the muscular movements of the stomach and of the lower bowel are much impaired. This impairment of the secretory and motor functions of the stomach deranges the function of nutrition at its very outset. It also influences nutrition in a number of other ways. Thus it promotes the assimilation of food and the multiplication of cells (growth). An interesting example of the latter is afforded by the developing chick's intestine when grown *in vitro*. Explanted, about the eighteenth day of development, in normal fowl plasma, it grows profusely; but when explanted in plasma from a fowl fed on polished rice—which is deficient in this vitamin—growth is scanty or altogether inhibited. Further, if the vigorously growing tissue be transferred from the normal to the deficient plasma, growth immediately ceases and the young cells undergo rapid disintegration. It is notable that intestinal tissue is particularly sensitive in this respect—a fact which can scarcely be without significance in relation to the immature gastro-intestinal tract of infants.

Amongst other effects of want of this vitamin are degeneration of lymphatic tissue, atrophic changes in the spleen and sex glands, disturbance of carbohydrate metabolism, reduction of the glycogen normally stored in the liver and the accumulation of a toxic substance (lactic acid) in certain tissues which may cause functional paralysis and convulsive seizures. Beri-beri is always associated with deficiency of this vitamin, though the vitamin deficiency is not always followed by beri-beri; the deficiency is not the only factor concerned in its causation. Beri-beri is rarely encountered in this country; but it is not unlikely that other forms of neuritis, such, for instance, as alcoholic neuritis, may be due as much to inadequate absorption of vitamin B_1, consequent on derangement of digestive processes, as to toxic action.

The insufficient ingestion of vitamin B_1, is a common food fault, due mainly to the extensive use of vitamin-poor or vitamin-less carbohydrate foods, such as polished rice, white flour and sugar. It has to be remembered in this connection that the more carbohydrate eaten the more vitamin B_1 is required. The effects of its inadequate provision are loss of appetite, impaired digestion, decreased motility of the stomach, sluggish bowel action, impaired growth of the young during the lactating period consequent on deficiency in the mother's milk, deranged function of the adrenal glands (possibly a cause of distressing dreams), nervousness, loss of water from the blood, loss of weight and vigour, and fatigue. In infants there may be stiffness of the arms and legs, rigidity of the neck, restlessness, fretfulness and pallor. This vitamin has an important relation to the secretion of milk, much more of it being needed during the lactation period than at other times. Its abundant provision during pregnancy is also of great importance. Its richest natural source is dried brewer's yeast. Rice polishings, bran and wheat-germ are all good sources of it, as are whole cereal grains. Yolk of egg, liver, kidney, heart, watercress, cabbage, spinach, lettuce, carrots and tomatoes are other excellent sources. It is to be noted that milk and muscle meat are relatively poor in this vitamin, so are fruits. An important practical point is that, when vegetables are

cooked in water and the water thrown away, more than half of this water-soluble vitamin is lost.

Vitamin B_2 is especially concerned in maintaining the health of the skin—both that covering the exterior of the body and that—the mucous membrane of the alimentary tract—lining its interior. It is concerned also in maintaining the integrity of the nervous system, and appears to have some part to play in the prevention of anæmia. It bears a quantitative relation to the fat-content of the diet: the more fat ingested the more vitamin B_2 is needed—a fact not to be forgotten when the digestion of fats is found to be poor.

Deficiency in the diet of this fraction of vitamin B gives rise to gastro-intestinal disorder (degenerative and inflammatory states, such as gastritis, enteritis and colitis), to lesions of the skin and, when the deprivation is severe, to mental derangement. It, or a fraction of it (possibly vitamin B_6), is specifically related to the disease known as pellagra ; but this relation appears to be much the same as that of iodine-deficiency to goitre or of B_1-deficiency to beri-beri—it is not the sole, nor probably the ultimate, cause. Of far greater importance is it to keep in mind that a generous provision of vitamin B_2 is one of the factors on which the health of the skin, the gastro-intestinal tract and the nervous system depends. In rats, under experimental conditions, cataract has been observed to result from its want.

It is not yet definitely known whether it is the B_1 or the B_2 fraction of the complex which contributes so markedly to the prevention of microbic invasion of the body. This is not a matter of great practical importance, so long as it is recognised that vitamin B does play a part in this connection. Many years ago I showed that, in animals fed on food deficient in vitamin B, bacteria were apt to find their way through the walls of the intestine into the blood-stream. Further, bacteria normally absent from the small intestine may migrate thereto from the colon where, normally, they are present; in the latter location they are harmless, even useful, in the former they have a noxious action.

The vitamin B-complex appears, as does vitamin C, to have some relation to the nutrition of the joints. Recent investigations in regard to rheumatism indicate the need for the adequate supply of both these vitamins in this condition.

Rich sources of vitamin B_2 are dried brewer's yeast, liver, kidney, muscle meat, eggs, milk and green leafy vegetables. It is to be noted that whole cereal grains are in general poor sources of B_2 though relatively rich sources of B_1, that muscle meat and milk, while rich in B_2 are relatively poor in B_1, and that white of egg is the only known food in which vitamin B_2 occurs without B_1.

Vitamin C.—Vitamin C is now known to be identical with ascorbic acid—a potent reducing agent. It is thought that the biological activity of ascorbic acid may depend on its double function of oxidation and reduction. If this be so its deficiency in the diet would involve the depression of oxidation processes. Vitamin C has a specific relation to the supporting tissues of the body, " enabling the cells to produce and to conserve inter-cellular substances that cause setting of the matrix in which the cells lie and are supported "—an enlightening observation which we

owe to two American observers. It is as if the bricks of which a house is built were to produce substances that caused the mortar supporting them to set, and went on doing so to prevent its unsetting. This function has a particular concern for the blood capillaries; the cells comprising which may become loosened in their settings for want of it and blood extrude between them into the tissues.

Deficiency of vitamin C may lead to hæmorrhages in various parts of the body, to sallowness and other affections of the skin, to fragility of bones, swelling of joints, imperfections in the teeth, unhealthy gums, congestion of the bladder, changes in the bone-marrow, gastro-intestinal disorder (such as duodenal ulcer—in guinea-pigs), and to latent or manifest scurvy. Like vitamin B it has a specific relation to the adrenal glands—its chief storehouse in the body—which undergo enlargement when it is deficient in the diet. This observation, which I made in 1919, calls to mind the enlargement of the thyroid gland—the chief storehouse of iodine in the body—which results from deficiency of iodine. Like proteins and vitamins A and B, but in its own particular way, vitamin C has an anti-infective action. It has, for instance, recently been shown that guinea-pigs, fed on diets poor in vitamin C but not sufficiently lacking in it to cause manifest scurvy, develop the symptoms characteristic of rheumatic fever when streptococci, isolated from cases of this disease in human beings, are administered to them; guinea-pigs receiving diets rich in vitamin C do not, or only in relatively few cases, develop these symptoms when similarly treated. The same appears to be true of intestinal tuberculosis: a high proportion of those receiving too little vitamin C develop tubercular ulceration of the intestine when virulent tubercle bacilli are administered to them by the mouth, while only a small proportion of those receiving abundance of vitamin C develop this condition when similarly treated. These observations in guinea-pigs may prove to be of significance in regard to rheumatism and intestinal tuberculosis in man; for man resembles the guinea-pig in this that he is equally sensitive to want of vitamin C.

Rich sources of vitamin C are parsley, orange peel, green chillies, cabbage, orange juice, lemon juice, brussels sprouts, cauliflower and other green leafy vegetables. It is to be remembered that leafy vegetables rapidly lose a great part of their contained ascorbic acid as their freshness diminishes.

Vitamin D.—The function of this vitamin is to promote the absorption of calcium from the intestine and to assist in maintaining its normal level in the blood. It is a chief regulator of calcium and phosphorus metabolism and the fixer of calcium in the bones and teeth. Through this regulation it serves to ensure and to maintain the normal structure of the bony framework of the body and of the teeth. It is associated, in the control of calcium metabolism, with the parathyroid glands whose secretion is a mobiliser of calcium, releasing it as occasion demands or as exceptional circumstances determine from the bony structures of the body. The metabolism of calcium is thus controlled by a substance derived from food as well as by a substance manufactured by the body

itself. The deposition of lime and phosphorus in growing bones is also related to a ferment—phosphatase—which is normally present in them.

This vitamin has an important relation to the bone marrow, helping to ensure the normal proportions of its cellular constituents. Its deficiency in the diet leads to mal-absorption of calcium from the intestine, to shortage of calcium in the blood, to the imperfect deposition of lime and phosphorus in the bones, and to the occurrence of rickets. The structure of teeth is similarly impaired by its want, with resultant dental decay. Enlargement of lymphatic glands in various parts of the body—neck, groin and axilla—may also result from its inadequate supply. Another malady to the causation of which deficiency of vitamin D contributes is osteomalacia; a condition in which great deformity of bones occurs. This malady is common in certain parts of India and China and is usually confined to women. A very important consequence of deformities of bone brought about in these ways is alteration in contour of the pelvis; it is one that may give rise to serious difficulties during childbirth. Chilblains may be caused by partial deficiency of this vitamin in association with calcium-insufficiency.

It is not known whether vitamin D has any special anti-infective action, though sufferers from rickets are very prone to certain infections, especially of the respiratory tract. Rickets of severe type is, happily, much less common in this country than formerly, although, as recently as 1928, it was stated that 90 per cent. of elementary school children in London suffered from minor degrees of it.

The animal organism is endowed with the capacity to manufacture its own vitamin D following exposure of the body to the ultra-violet rays of the sun. Foods may also be activated in the same way or by artificial ultra-violet irradiation. Vitamin D is nowadays manufactured synthetically by the ultra-violet irradiation of ergosterol. The product is known as calciferol and is potent in very small dosage.

The sources of this vitamin are relatively scanty: cod-liver oil, halibut and other fish oils, liver, kidney, butter and yolk of egg are the chief. It is, indeed, difficult in countries where sunshine is scanty for children to obtain enough of it unless the diet is fortified by the addition to it of cod-liver oil or of calciferol. In the administration of the latter great care must be taken to avoid overdosage, the effects of which may be serious. Rickets is by no means unknown in the Tropics, usually occurring in those castes observing the Purdah system.

Vitamin E.—Vitamin E is concerned in the maintenance of the functional efficiency of the reproductive system: a concern which it shares with protein, and with vitamins A and B. It is not yet clear that it has any very important part to play in this regard in human beings. It is widely distributed amongst foodstuffs; occurring in wheat germ, eggs, milk, meat, lettuce, spinach, watercress, coco-nut oil, cotton seed and a number of others.

Vitamins in General

It will be apparent from the foregoing facts that each vitamin has specific relations to certain structures of the body: vitamin A to epithelium and nerve;

vitamin B to the gastro-intestinal tract, nervous system and skin ; vitamin C to the cement substance that binds the cells of the body together ; vitamin D to the bones and teeth ; and vitamin E to the reproductive system. Their relations are not, however, confined to these : thus, one may support another in maintaining the health of the skin, the teeth, the bones, the gastro-intestinal tract, or the nervous system ; and all are closely intertwined in their action with other essential constituents of the food. Consider, for example, the factors concerned in maintaining the structure and health of the teeth. There are, to begin with, the minerals—calcium and phosphorus—of which the teeth are mainly composed and of which an adequate supply must not only be provided in the food but adequately absorbed from the intestinal tract. There is the vitamin D needed to ensure both the proper absorption of calcium and its proper deposition—together with phosphorus—in the teeth. There is the vitamin C required to maintain the matrix in which the cells of the teeth lie. There are the vitamins A, C and B_2 needed for the maintenance of the health of the gums and alveoli in which the teeth are set. All of these are essential to the normal structure and health of the teeth, and deficiency of any one of them may give rise to dental decay. The dietetic causes of dental caries are, therefore, multiple (and not the least of these is the excessive use of sugar). The same is true of many other diseases of a degenerative kind in the causation of which malnutrition is concerned. For the maintenance of health of any organ or part of the body the adequate supply of all things needed for normal nutrition is necessary. It is true that the outstanding deficiency of one or other essential may give to the resultant disturbances of structure or function characters which we recognise as specific disease entities, but even then default of other essentials may contribute to their production.

It is during the early and growing period of life that an optimum supply of all vitamins, as well as of other essentials concerned in the maintenance of structure and function of the body, is so necessary. For the foundations of disease are often laid by their inadequate provision in early life. This is particularly true of deficiency of vitamins A and B, which may leave behind them diseased states—as of the gastro-intestinal tract—that subsequent administration of these vitamins by the mouth may be unable to remedy, though their parenteral administration may prove more effective. During pregnancy also—and lactation—an abundant supply of vitamins of every kind is needful, as well for the child as for the mother. Indeed, at all times optimum efficiency of the body and of its various functions depends, in great part, on an optimum supply of vitamins. Their function is not merely the prevention of the " deficiency diseases "—xerophthalmia, beri-beri, pellagra, scurvy and rickets—with which they are usually associated by name ; being called " anti-this " or " anti-that." The use of these limiting descriptive terms—anti-xerophthalmia," " anti-beri-beri," " anti-scorbutic " and so on—however well they may have served their purpose in the past, when we were largely groping in the dark, is, as I pointed out fifteen years ago, objectionable. For they concentrate attention on particular " deficiency diseases " and convey the impression that all the

vitamins have to do is to prevent them. Attention is thus diverted from their far more important relations to structure and functions of the body as a whole. All these specific deficiency diseases are associated in their origin with severe degrees of vitamin-deprivation. But outside the laboratory these severe degrees are encountered relatively rarely. Milder degrees are much more common; and, as far as vitamins A, B and C are concerned, bacterial or other pathogenic agents may, and often do, combine with these milder degrees of vitamin-deficiency to produce illnesses differing widely from the specific deficiency diseases with which the vitamins are commonly associated in the professional and lay mind. The inadequate ingestion of vitamin A does not, for instance, always cause xerophthalmia; infections of the lungs, skin or intestinal tract are often the consequences of it. So, too, with vitamin B: poor appetite, some digestive disturbance, nervousness, feeble action of the heart, lack of vigour and fatigue may be evidences of its inadequate supply, where no signs of beri-beri exist. Similarly, in regard to insufficiency of vitamin C, there may be no manifest signs of scurvy yet it may be present in a latent form, as that great authority on the subject—the late Alfred Hess—assured us that it often is. No teaching could be more purblind, in the light of our present knowledge (incomplete though it be) of the important relations of the vitamins to structure and functions of the body, than that which affirms there is no insufficiency of vitamins A, B, C or D because there is no xerophthalmia, no beri-beri, no pellagra, no scurvy or no rickets. There may be no vitamin-insufficiency; on the other hand, there often is. I speak now of optimum health; not of that sub-optimal state of being which so many are content to regard as good health.

Since the year 1921 I have used every occasion to emphasise that it is the lesser degrees of vitamin-deficiency, and the less obvious manifestations of such deficiency that are of importance in Western countries. A recognition of this fact is, I believe, essential to the prevention and cure of many of the commoner sicknesses of mankind—sicknesses to which we cannot always attach a diagnostic label. "It is rare," as I wrote in 1921, "that the food of human beings is totally devoid of any one vitamin; it is more usual for the deficiency to be partial, and for more than one vitamin to be partially deficient; it is more usual still for partial deficiency of vitamins to be associated with deficiency of suitable protein and inorganic salts and with an excessive richness of the food in carbohydrates. Consequently, the manifestations of disease resulting from the faulty food are compounded of the several degrees of avitaminosis on the one hand, and of ill-balance of the food on the other. Nor is this all, for pathogenic organisms present in the body, during the period of its subjection to the faulty food, contribute their share to the general morbid results . . . Other factors also, such as age, sex, individual idiosyncrasy, rate of metabolism, fatigue, cold, insanitary surroundings, overcrowding, the varying susceptibilities of different individuals, of different organs and of the same organs in different individuals, all play a determining part in the production of the morbid result of food deficiency. So it is that in practice the

manifestations of deficiency disease are influenced by a number of factors apart from the actual food fault. It may be expected, therefore, that wide variations in the incidence, the time of onset, and the character of the symptoms will occur in human beings in whom the dietetic fault has been to all appearances the same . . . It is to this variety of morbid change that I desire to draw attention . . . since it seems to me to impart to the term ' deficiency disease ' a wider significance than has been attached to it hitherto." At the time these words were written they were received with some scepticism, yet to-day " it is becoming generally recognised that much sub-normal health and development, and even incidence of disease, are associated with a partial deficiency of one or more of the accessory substances."*

If the knowledge acquired during the past quarter of a century is to yield its fullest fruit in the betterment of the national health it must be recognised that an optimum supply of all vitamins, in an otherwise well-balanced diet, is a pre-requisite of optimum health; and that a minimum supply, while it may suffice for the prevention of certain specific " deficiency diseases," creates the conditions precedent to the occurrence of a wide range of other sicknesses.

All of which, in regard to vitamins, is not to minimise the great importance of other food-essentials in maintaining nutritional harmony and this, in its turn, the melody of health.

OBITUARY

Dr. Edward Weston.—Dr. Edward Weston, who died on August 20th, was one of the pioneers of the electrical industry, and founder of the Weston Electrical Instrument Corporation, and the Weston Electrical Instrument Co. Ltd., Surbiton, of which companies he was a director at the time of his death.

Dr. Weston was born in 1850 on the borderline between England and Wales, but went to the United States at the age of 15. He first of all devoted his energies to the improvement of the then existing D.C. dynamos, and soon attracted notice by two fundamental contributions, the laminated armature core and the field rheostat. His interest in power generation led him to start a number of power companies, some of which are still in operation.

Feeling himself handicapped in his work by the lack of instruments for taking simple and direct readings of electrical values, he set to work to develop the equipment he needed. In 1888 he produced the first direct-reading electrical indicating instrument ever made. This was the Weston Model I, which even now is a recognised " standard." His other major inventions included the external shunt, the production of " Constantan " and " Manganin," and the officially-accepted international standard of E.M.F. (the Weston standard cell, using cadmium and mercury electrodes).

Dr. Weston was the first commercial user of bakelite, and his faith in the product of Dr. Baekeland, so widely used to-day, is a typical example of his remarkable

* Medical Research Council's Report on Vitamins, 1932.

foresight. Later developments for which he was responsible included improvements in the moving-iron type of instrument, the development of the direct-reading electro-dynamometer, the compensated thermo-couple instrument for high-frequency A.C. measurements, the rectifier bridge for A.C. measurements, and the first commercially practical dry disc photo-electric cell.

Dr. Weston was a past-president of the American Institute of Electrical Engineers and he received many diplomas and awards, the most recent of which was the Lamme Medal, presented to him in 1933 " for his achievements in the development of electrical apparatus, specially in connection with precision measuring instruments." He had been a Fellow of the Society since 1904.

NOTES ON BOOKS

THE IDENTIFICATION OF TREES AND SHRUBS. By F. K. Makins. London : J. M. Dent and Sons Ltd. 15*s*.

This amply illustrated book was put together to enable the amateur without previous knowledge of the subject to identify " any tree or shrub he is likely to meet with, growing in the open in any part of the British Isles." By means of the glossary and key provided at the beginning of the book anyone ought to be able to do this. 1,311 species, belonging to 534 genera, are shown in line drawings. The format of the book has enabled the author to make these drawings large and clear. There follows a description of the plants, with their place of origin. Finally, there is a very complete index.

A book marker is provided, with graduated sides for measuring specimens, and a list of the symbols and abbreviations used. Mr. Makins, who is very well qualified to produce a book of this kind, has done his work admirably, and though the price is comparatively high no possessor of the book is likely to regret his purchase.

P. B.

CORRESPONDENCE

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Oxford.

FOOD SUPPLIES IN TIME OF EMERGENCY.

Whilst the output figures collected by statisticians are of undoubted value in connection with the problem of food supplies in time of emergency, there are other facts, the outcome of discoveries made by science, which must be borne in mind, if we are to view the whole question in its proper perspective. For, although our main centralizing idea must be to lay plans or take steps now in order that, should an emergency such as war arise, an increased physical output could be quickly obtainable from the land, another important point to be borne in mind is that not only the present output but the possible further increased output should contain the maximum amount of what are now known as the protective-foodstuffs.

Before attempting to lay down any plans by which this increased output can be obtained, it is vital that we should face the most important questions, namely :

(1) What now constitutes the limiting factor as regards physical output? (2) In which department or departments of a farm can the biggest percentage increase be obtained by a different system of management?

If one studies the work that has been done at the various costing centres, and notes the results obtained by several people in connection with carefully-controlled experiments, one gets the same answer to both questions, namely, "*grass*." And, furthermore, the milk produced under this new system of management should contain more of the protective ingredients, the whole year round, than it does at present.

Assuming that the details of management whereby this increased output might be obtained become more generally known than they are at present, we shall then want to know what is to be done with this power of increased production, or in what way is it to be directed. There are two closely allied dangers to be guarded against, the danger of over-production and the danger of raising production to such a point that it upsets the existing trade arrangements. The same kind of investigation will have to be applied to meat production.

Having once settled these very difficult points, it would then be possible to estimate whether some of the present existing grassland could be devoted to other uses. Any of us who had experience during the War of breaking up grassland for cereal growing would feel it much safer to keep the largest possible acreage under cultivation in ordinary times. But, in order to upset the existing trade arrangements as little as possible, the cereals, or the bigger proportion of home-grown cereals, should be devoted to the feeding of poultry, and then in case of dire necessity the poultry could be destroyed and the cereals used for direct human consumption.

From the work done at the various costing centres we know that to attain financial success the percentage of capital turned over, the output per man and the output per acre are all points which have to be studied, the whole culminating in the average net output obtained over the whole acreage farmed. By improving the output from grassland the net output over the whole acreage is raised, and, furthermore, as the keeping of cattle gives rise to farmyard manure, this will help to maintain the fertility over the rest of the farm.

The initiation of this improvement must come from the landlord and will involve him in new expenses for fencing and water. In order to get a return on this money he will have to charge higher rents, which in turn will result in heavier taxation under Schedule A and more Death Duties. This brings us to politics, so it will be the work of the politician to devise some means of encouraging the landlord or owner-occupier to embark on this expenditure.

R. DASHWOOD.

GENERAL NOTE

FIRST PUBLIC SCHOOLS ART EXHIBITION.—The first Public Schools Art Exhibition is being held at the Imperial Institute, South Kensington, S.W.7, from September 10th to October 9th, in aid of the well-known Dockland Settlements in the various dock areas of London and the Provinces. Entries have been received from over 65 Public Schools and lectures and addresses will be given by well-known speakers on each Sunday afternoon. The price of admission is 1*s.* for those under 18 and 1*s.* 6*d.* for adults.

JOURNAL OF THE ROYAL SOCIETY OF ARTS

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

AN UNUSUAL VIEW OF THE SOCIETY'S HOUSE

The demolition of the buildings opposite the Society's premises has opened up a clear view of the House to buildings in York Street, and rendered possible the taking of the remarkable photograph reproduced on p. 1112. Mounted copies of the photograph, 20 inches by 15 inches in size, and in black and white or sepia, may be obtained from the photographer, Mr. A. F. Kersting, 37 Frewin Road, London, S.W.18, price 7*s.* 6*d.*

PROCEEDINGS OF THE SOCIETY

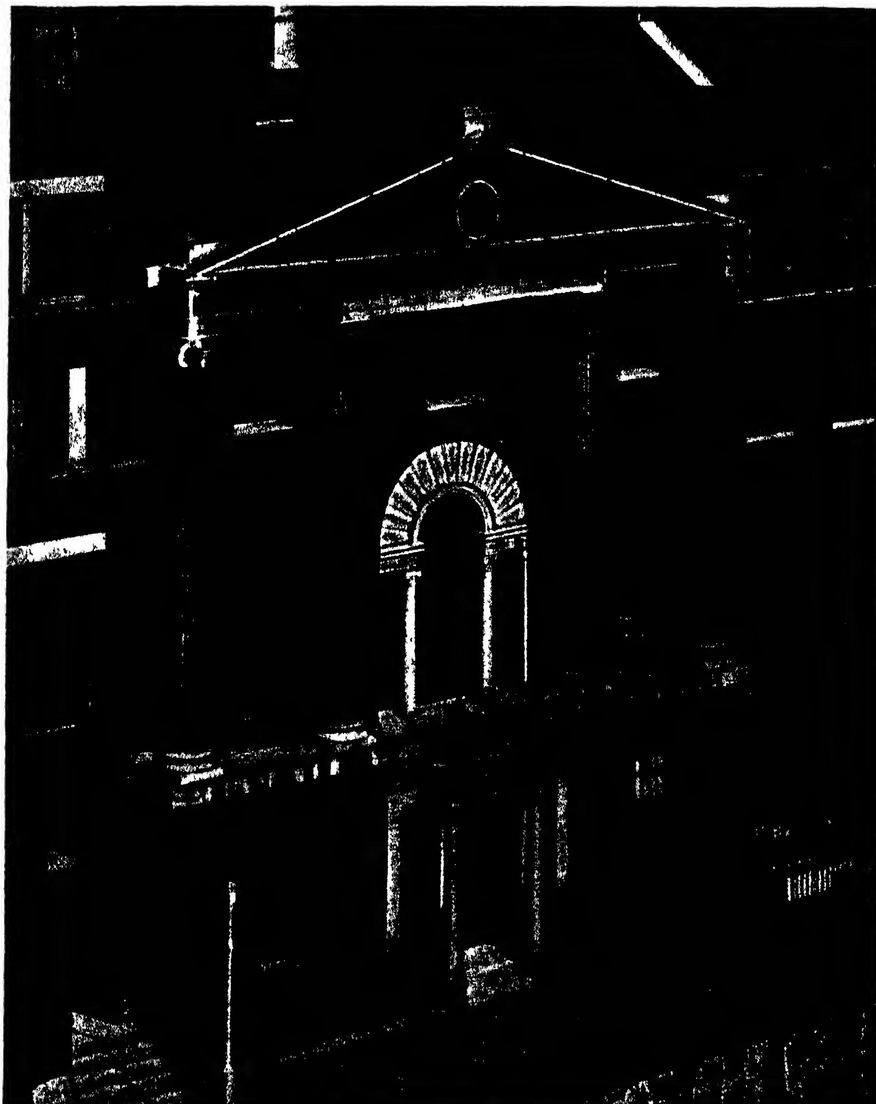
CANTOR LECTURES

LETTERING AND ITS USES TO-DAY

By Percy Smith

Lecture I—*Delivered 9th March*, 1936

My first words must be of thanks to the Royal Society of Arts for giving me this opportunity to speak about a subject which captivated my imagination even as a boy and has since captured not indeed all, but a good proportion of my time and thought. We read on the frieze which so fitly decorates the elevation of this building, that the function of the Society is the promotion of Arts and Commerce. I am one of those who claim that the practice of Lettering is, in a modest yet very true sense, one of the Arts, but assuredly, without its use Commerce, as we know it, could neither be promoted nor continued. So in promoting Lettering we may claim that the Society is fulfilling not one, but both its objects.



THE SOCIETY'S HOUSE FROM YORK STREET.

The subject of these lectures is "Lettering and its uses to-day," but, in my view, we are not likely to create an atmosphere in which lettering will be used to its utmost effectiveness unless we know at least something of its origin, development and background. As all those interested in any branch or sphere of education know, background is of vital importance; background gives continuity; it gives substance and strength and richness. It must be admitted that Lettering is one of the most necessary of the crafts; it was also one of the earliest to find expression. It is well, therefore, that we should see something of its romance, as well as of its beginnings.

I must leave you to imagine the thrill that must have come over the first man—or, indeed, it may be more correct to say the first woman—who discovered a way of leaving behind or of sending on ahead a silent message, a very different thing from the drum-calls or drum-news of many savage tribes. It was a thrill probably experienced by many individuals in many parts of the world at different times.

In that treasure-house which we call the British Museum are arranged three sticks which come from Australia. They are notched. The authorities consider that the incised marks are probably aids to memory and not in themselves capable of any constant interpretation. Nevertheless, the meaning of the centre stick was stated by the native from whom it was obtained to be (I translate into modern English): "I want to walk about; when I have finished my walk along the bush, I will come back."

Another type of silent communication is the assemblage of knotted cords found in a grave of Peru, dated roughly as tenth to fifteenth century. It is believed that this system of recording numbers and apparently also simple facts and ideas by means of knots in cords was the nearest approach to "writing" existing in South America before the Spanish conquest. The exact meaning of a given knot, we are told, depends both on its actual form and also on its position on the string.

But I pass from these crude symbols to the well-known hieroglyphics* of the Egyptian civilization, with their remarkable character and their no slight beauty. These symbols were, as is very well known, often carved on the walls of memorials, and I was continually being astonished, when in Egypt in 1931, to observe with what exquisite delicacy and subtlety of craftsmanship these animals, birds and other forms were portrayed. They remain, to-day, an enrichment to the background of lettering.

From the picture-writing of Egypt I pass to that of the Far East. Here the native symbols have become more formalized through the centuries. It is perhaps well to note that while the more famous Egyptian characters were cut in stone and while the forms of our own European letters have been largely influenced by the chisel and pen, Chinese writing since time immemorial has been based on the use of the brush; speed and vitality are of its essence.

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* The Lecturer here showed on the screen, by courtesy of Dr. John Johnson, an impression from Three Line Nonpareil Hieroglyphic type, cast at the University Press, Oxford, 1925. The drawings were made by Mr. and Mrs. Gavis Davies from the originals of the Eighteenth Dynasty in the tombs of Thebes. The matrices were cut by Messrs. R. P. Bannerman & Son, Ltd., and the fount is owned and controlled by Dr. Allen H. Gardiner.

It is generally agreed that our own roman letters are derived from the Phœnician symbols. The actual transformations which occurred were partly a matter of accident—the accident of tool and material—and partly of convenience, the convenience of swifter execution. Many early 'manuscripts' were scrawled in soft clay with the stilo and then baked to give them permanence. But whether done with a stilo or with a chisel, the letterers of that day apparently found straight strokes easier to do than curved, and this fact tended to influence the character of letter forms in the more formal expressions of both the Greek and Latin alphabets. The latter reached its highest perfection in outline, proportion and detail as carved by the Romans on their memorials. If I may quote from an early publication of my own,* "The classic Roman letter can be as perfect and entirely as beautiful a form as any evolved by the mind and skill of a man. At its best it possesses intellectual symbolism, organic construction and the strength engendered by over a thousand years of tradition. It emerges always new from the only test that matters—the test of time. Its main forms are as modern now as when a Roman carved them on the Trajan column and on the arch of Constantine; its rank among the crafts for satisfying completeness and dignity is that of the fit human body among natural forms . . . A Roman letter, being capable of such expression, cannot truly be said to be embellished by any added ornament. In architectural inscription it stands alone, sufficient in its spaciousness and quietness, asking nothing." And in books, as type, it may equally so stand.

I have treasured for many years the accompanying photograph (Fig. 1), because of the exceptional combination of grace and strength in the letters. I remember discovering these in an early sample book of engraved alphabets more than twenty years ago, and having them photographed; but particulars had been lost and I could obtain no details until Mr. Graham Pollard and Mr. Stanley Morison, both in response to a request for help, were able to tell me that these letters came from a book published by Giovanni Cresci in 1560. It is of interest to note that Cresci affirms in the introduction to one of his editions that he took for his model the well-known inscription at the base of the memorial to the Emperor Trajan.

The beauty of these letters does not consist mainly in the perfection of their engraving, though this enhances their charm. Their beauty consists largely in their proportions. Note the comparative and natural narrowness of the B, E and S amongst others; the bold width of the round letters, yet in the case of the O for example, not quite so wide as to be a circle. Note the freedom with which, in letters like the C, the differentiation between the upper and the lower swing of the curve is shown; and the lively manner in which the curve of the D grows from the lower part of the straight stem and swings on and down to the head. The H I should like to see a little wider. The serifs are small, well under control and yet grow out of the stem gracefully and without effort. They are delicate appropriately,

* "Initial letters in the Printed Book," by Percy Smith, *The Fleuron*, Vol 1, 1923.

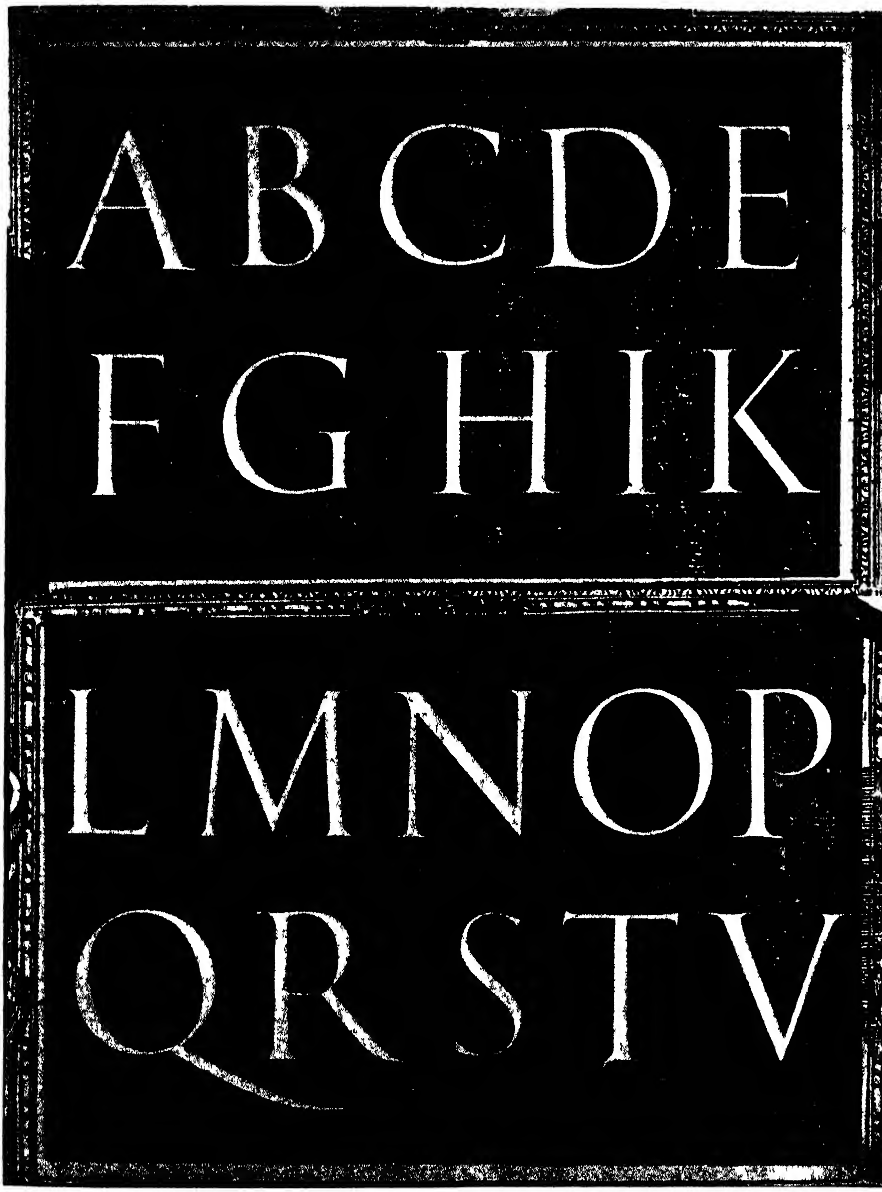

FIG. 1.—ENGRAVED LETTERS FROM A COPY-BOOK BY GIOVANNI CRESCI. 1560, SLIGHTLY REDUCED.

because cut in the fine texture of metal and meant to be looked at in a book held in the hand. Were they cut in stone and meant to be viewed from a distance they would require to be bolder.

I shall have more to say about precision of technique later, but here is another illustration (Fig. 2) where considerable excellence is obtained in its absence. It was after a lecture on lettering, some years ago, that a man came to me and said that he had been cutting letters in a monumental mason's yard for many years, but now he would like to do some which would be 'less dull.' Would I help? A few days later, I called by arrangement at his little workshop in a suburban back garden. He had a piece of Sicilian marble, measuring eighteen inches by fourteen inches. On it I invented some words which not only expressed a thought, but which also enabled me to vary the size of the letters and so demonstrate proportions of words and letters and the importance of spacing. We spent a little time together and he did two or three letters for practice. He then proceeded to cut the inscription which is reproduced. He was accustomed, so he told me, to doing block letters which were invariably filled with lead, so that the interior of the cutting was irrelevant. He was, of course, thoroughly accustomed to handling the hammer and the chisel, but these letters were his first attempt at the more classic forms, which not only required greater knowledge of and feeling for shape but also required the more difficult technique of the clean incised letter. There are naturally signs of inexperience; the O's lack the grace and roundness of those in the previous figure, but in spite of this, the proportions, spacing, right method of work, and the attempt to follow a good model give a pleasing measure of success before any technical excellence has been achieved.

We need not hesitate to attempt things, despite inexperience in actual technique, provided that the method employed is on the right lines.

In spite of this, however, a greater command of the tool should make possible a greater vitality of form. However much we may desire to be original and to invent new forms, we are more likely to do satisfying work if we first let our minds dwell on the use of the tool to its utmost capacity. The roman inscriptional or ceremonial letters owe their severity and dignity largely to the limitations of tool and material, of chisel and stone.

Painted letters, though based on the same skeleton forms, should show the flexibility of the brush and should *not* be imitations of those produced by a pen or a chisel. Neither should they be limited by the outline of any drawing previously made as a guide.

In all circumstances, probably, it is a good thing, within certain limitations, to let the tool—whether chisel, brush or pen (Fig 3)—have its way. As Vernon Blake has put it,* "what matters is the way in which the producing tool is employed . . . To the true artist, the very handling of the tool is a joy, the commanding of its movement is the fact itself of his artistic creation."

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* *The Art and Craft of Drawing*, by Vernon Blake, p. 54. Oxford University Press: 1927.

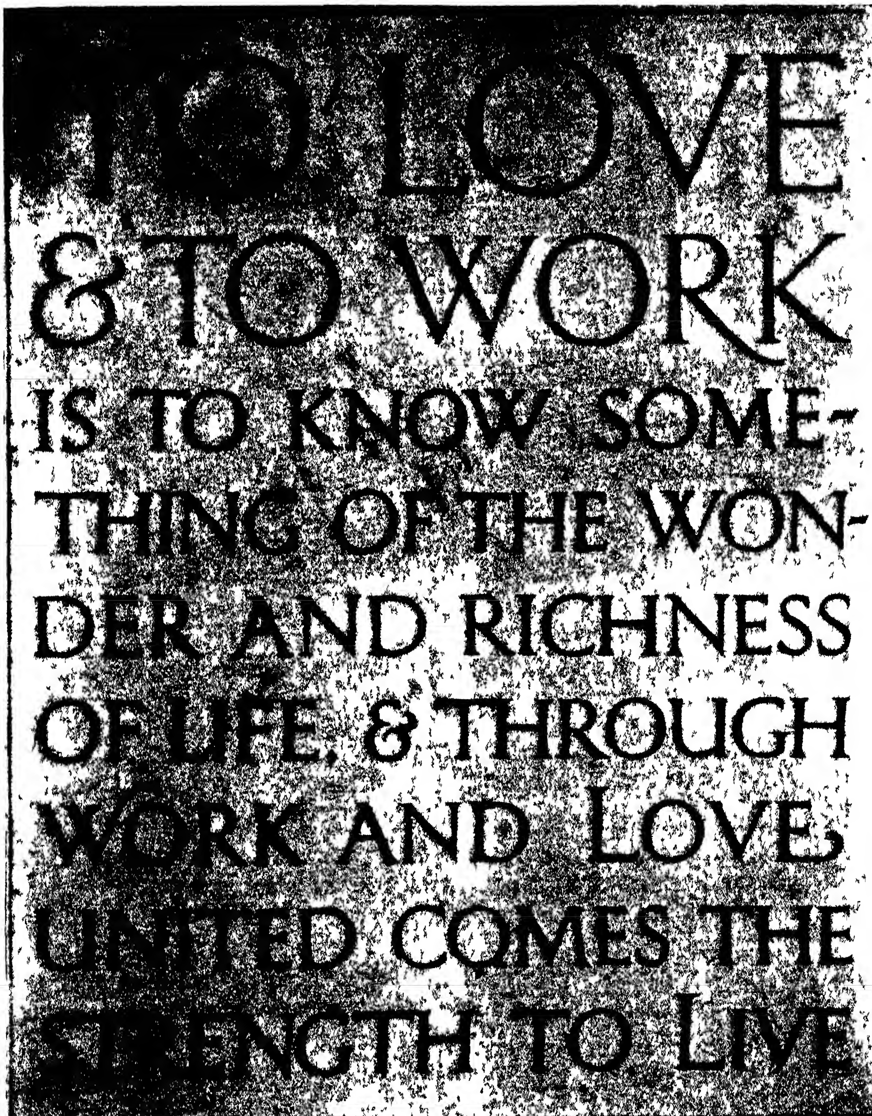

FIG. 2.—INCISED INSCRIPTION IN MARBLE : PAINTED RED.

The third tool we have to consider is the pen, by which I mean what is called the "broad-nibbed" pen (though not necessarily *very* broad). It has probably had more influence on our Western letters than any other instrument. Used with even pressure, it gives a uniformity of thick and thin strokes, quite different in character from that of either chisel or brush. To its easy and speedy use is largely

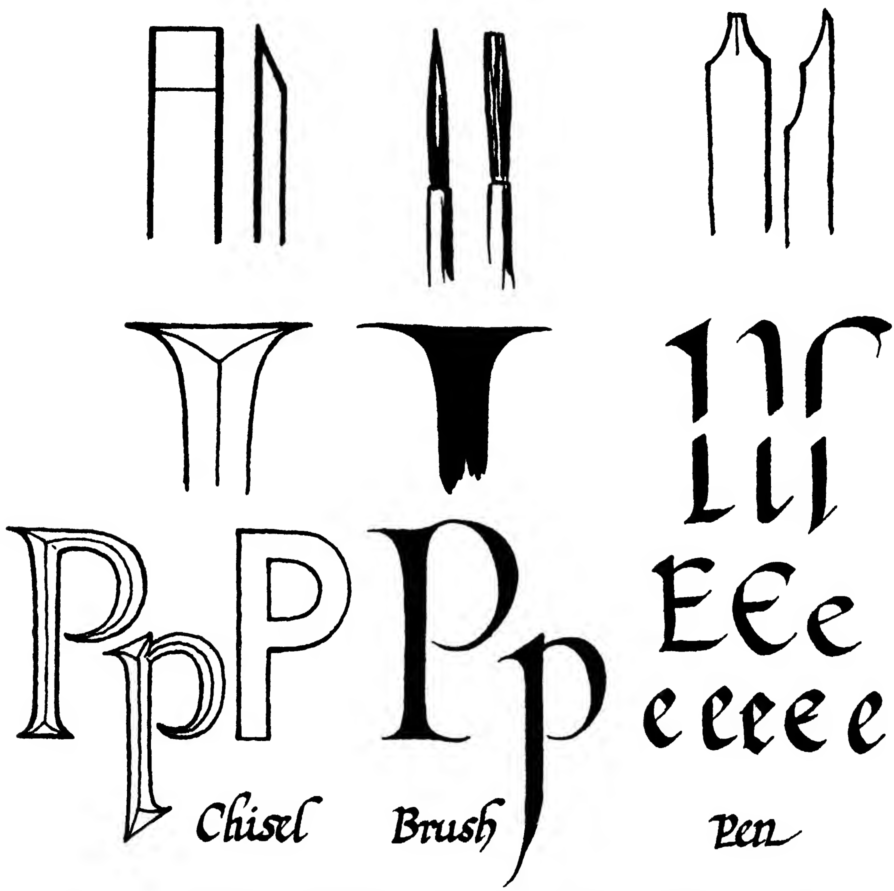

FIG. 3.—DIAGRAM ILLUSTRATIVE OF THE INFLUENCE OF TOOLS ON FORM.

due the evolution from majuscules, or capitals, to minuscules, or small letters. To summarize this evolution very briefly, we may say that scribes found it easier and quicker to write curves than angles; thus round letters grew from the square roman capitals; by the same process and for the same reasons, added to the desire to save space, minuscules, or small letters, came about. To save yet more space and time, the original wide half-uncials became compressed and, when written with a slanted pen, became angular, as in gothic, saving yet more space. In contrast to

gothic, practised chiefly in Germany and Northern Europe, we have the roman or humanistic writing of the fifteenth century, with its home in Italy; and Italy, too, is the home of the italic, with its lateral compression giving economy of space and its slight slant as a further aid to speed.

But there was another development in the opposite direction, concurrent with the simplification. Single-stroke letters developed into large and built-up versal letters, so-called because they were used to mark verses and paragraphs. Partly, doubtless, to make the letters more effective as marks, colour was used. Having once acquired this degree of importance, additional skill, time and affection were lavished upon them; gold was added to colour; ornament developed, and, bursting beyond the letter-space, grew into scrolls and borders; thus illumination arose.

Illumination is outside our subject to-night, but initial letters are definitely our concern and it is well that we should remember that they were born to supply a need. In modern books, both written and printed, and also for other purposes, initials may contribute vital and valuable services. Their contrast with the severity of the roman alphabet is dramatic. The varieties of decoration seem endless. The flowering of the letters, as it were, into buds and leaves; dots and lines around them of varied colours, the inside of the letter itself left open, a second colour inserted; the letter fitted into a rectangle, itself diapered or decorated in a hundred and one different ways. Letters were thus made gay and lively, and ultimately little pictures, known as miniatures, found their home in letters.

The time has passed, I think, when any useful purpose can be served by trying to keep alive the kind of decoration which has been used in the past. We should rather try out our own ideas, based on our own feeling for design and form. The two principal openings for initials to-day, apart from their use in manuscript books, is in embroidery and in the printed book. In embroidery they may be used for a multitude of purposes and may possess all the glory and colour of the finest illumination.

I believe we shall live to see a minor "Renaissance" in the use of initial letters in the ordinary printed book. But printers and publishers must cease utilising initials of the past, and artists should find their ideas and their subjects in the life of to-day. I shall speak further of initial letters in connection with modern decorative letters.

We must now go back to the roman capitals and watch the steps by which they assumed a modern garb. The process of their evolution had led to two standardized forms, the gothic and the roman. The illustration (Fig. 4) is an example of early fourteenth century gothic writing and of late fourteenth century type. It will be seen that the scribes influenced the type-cutters; the pen dictated the form of our early type letters. Were printing invented to-day, it is almost certain that our self-consciously æsthetic printers would say, "This is a new medium; we must look for its own special beauties; it must be different from the past; it must express its own character and its unique features and not those of another tool." That would be their aim.

In the fifteenth century there was less conscious æsthetic theory; at first, printing was simply a quick way of multiplying books. The printers strove to make them as much like pen-written books as possible. In making their type they copied the formal alphabet which was prevalent in their own particular locality.

Fortunately, when printing arrived in Italy, a light, open and very legible alphabet was being used by the scribes. The printer, there as in the north, followed suit and we have the beautiful and legible type of the Italian Renaissance books. For a time,

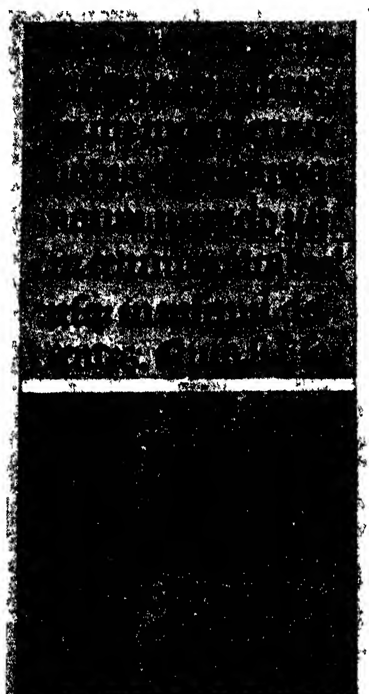

FIG. 4.—TOP : FOURTEENTH-CENTURY WRITING (*French*).
BOTTOM : FOURTEENTH-CENTURY TYPE (*French*).

England followed the northern style and our first printers printed in gothic ; but we have ever been first gothic and then Italian or classic, in our printing as in our architecture. We may be thankful that surely, though gradually, the roman predominated.

Yet I would not pass over the gothic without saying that it may be used with success for certain purposes, where quick and easy legibility need not be a major consideration; for example, in decorative friezes, tapestry, on hangings, in heraldry, and for titles where, words being short and isolated, they may be read with sufficient ease. Mystery is an attractive and a legitimate quality for lettering to

possess on occasion, though I think on quite rare occasion. In such cases, gothic may be used if its spirit is suitable from other points of view.

Before considering the modern expression of the roman, I must refer to yet a third branch of the original roman letter, namely, the italic. Italic performs one function similar to the gothic—it saves space by lateral compression, but it possesses more legibility and has the further attribute of grace. It is sometimes thought that it is not sufficiently legible for general use, but given a wise judgment as to appropriate size and spacing, I am inclined to think this a fallacy, and I look for their increasing use in auto-letters as well as in both jobbing and book printing. My view is that we shall in the future use it far more than we do now. Italic capitals are not, I think, successful as a rule in the mass ; they are needed chiefly as capitals to the lower-case letters.

Flourished italics are certainly well known to you. That they should be used only as initials to lower-case letters is a sound rule. Very occasionally, they may be used in combination, but then frankly as ornament.

As a contrast to these graceful and flowing letters, let us return to the original roman forms. I have stressed the importance of tools, but the man behind the tools and the environment behind the man are even more important. The taste and temper of the age inevitably finds expression in its lettering.

The roman character has of recent years garbed itself in a form known as the even-stroke sans-serif (Fig. 5). No. 1 was designed by Edward Johnston for the Underground Railway and was completed in February, 1916. It was largely used for posters, announcements and leaflets, and also as a pattern for station names and notices. No. 2 was designed by Eric Gill for the Monotype Corporation, and the first sizes were designed and cut in 1927. The great success of this alphabet is largely due, apart from the fact that it came at a most opportune moment, to its freedom from all affectation, or what is called " artiness." The letters are about as straightforward and simple as they can be. Nos. 3 and 4 are rightly admired type-designs by Rudolf Kock and Paul Renner respectively. They are a little more original, a little fresher in shape here and there. Such features make the designs intellectually and æsthetically interesting ; they do not hinder its usefulness for display printing, but I venture to suggest that departures from the norm lessen the value of type for use in mass. Special features in type tend to obtrude themselves between the reader and the thought conveyed. No. 5 was designed by Harold Curwen in 1912. He tells me that they were printed first from line blocks and were not cast as type until 1928. The lower-case was cut in 1931.

These sans-serif letters find their best uses in relatively large sizes. They are peculiarly suitable, for example, for public notices, especially where great clarity is needed. They are suitable for cut-out or stamped-out letters and for all material where serifs cannot easily be made. For embossing, stamping on leather, modelling and especially for small modelled letters such as are used on medals, one may indeed go a step further and slightly round the angles and ends of the strokes.

Thus *material* makes itself felt in the form of letters. But the square terminals

ABCDEFGH

abcdefghijk

1

ABCDEFGHIJKLM

abcdefghijklmnopqr

2

ABCDEFGHIJKLMN

abcdefghijklmnopqrst

3

ABCDEFGHIJKLMN

abcdefghijklmnopqr

4

ABCDEFGHIJKLMNOPQRS

abcdefghijklmnopqrstuvwxyz

FIG. 5.—MODERN SANS-SERIF LETTERS.
(Specimen page from *Lettering : a Handbook of Modern Alphabets*, by Percy Smith, now in the press. A. and C. Black Ltd.)

make the letters very self-contained. The eye cannot so easily or so swiftly pass along a line of these somewhat isolated units as when assisted by the finishing strokes or serifs which normally help to lead the eye on from one letter to another. This is one important reason why they are more suitable for use in relatively large sizes and short announcements than in small sizes and in mass. But whether cast in type, cut out in metal and applied to a background, or carved in stone, there is no doubt that these letters fit many needs of the present time, and harmonize with much modern architecture.

I had the pleasure of drawing this inscription (Fig. 6) for the London School of

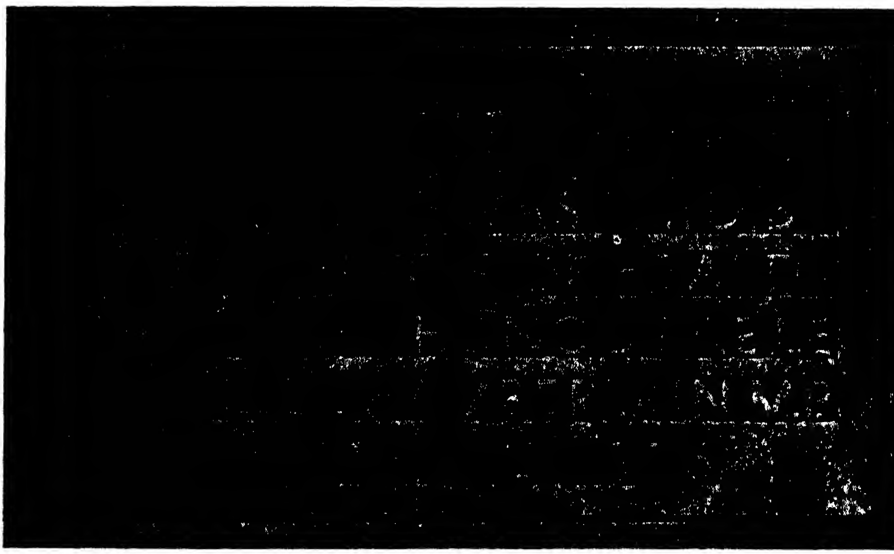

FIG. 6.—EXAMPLE OF RAISED LETTERS IN SUNK PANELS (STONE).
(*London School of Tropical Medicine.*)

Tropical Medicine. The letters are easy to carve ; there is no risk of breaking serifs. The system of sinking the letters in panels is a great economy of labour, for there is comparatively little background to be cut away. The parallel lines echo the horizontal lines characteristic of modern buildings and the weight and stability of the letters conform to the building of which the stone forms a part.

The great attraction of the sans-serif letters is their lack of fuss, their simplicity. But whether for good or evil, nothing satisfies for long. We believe in simplicity, but simplicity, it appears, is not enough. It may be safer than decoration, but safety first is a poor rule of life. We are never contented ; we must experiment here, and experiment there. Despite the passion for severity and plainness, there is still an urge for decoration and adventure ; there is still the call for the artist to follow the lead of his impulse and see what he can do towards expressing the astonishingly varied spirit and need of to-day.

Of the educational value of the study and practice of lettering much could be said, did time allow. All children should surely know something of the evolution of the letters they use, something of how, for example, letters changed from capitals to lower-case. I am glad to learn that lettering and writing has been adopted as an art subject in some schools. It means that a greater measure of time will be given to it. As a drawing subject, it has the great advantage that its practice cannot be sketchy or vague, but demands definition.

I have been told by elementary school teachers that after a course of lettering

FIG. 7.—A SCHOOL MOTTO BOARD, PEN WRITING ON WOOD, MUCH REDUCED.

their scholars not only drew figures better, but did their arithmetic more accurately, arranged their items better on the page, and were more orderly in their written work. As a concrete medium for the training of eye and hand, for the teaching of proportion and arrangement, planning and spacing, it is particularly apt. The search for unity, the making of many units to fit each other, which is so difficult to achieve, can be clearly demonstrated and practised in Lettering.

It is probably true that there is no sufficient body of teachers at present so trained as to be able to cope with the need. But the good attendances recently at classes of teachers on the subject and the keenness displayed, both according to report

and as seen in my own experience, justifies the hope that at least we are moving in the right direction.

My last words are before you (Fig. 7); they were written with a broad pen on an oak panel, by request, about eighteen months ago, the ink being afterwards covered with a light matt polish to give it permanence.

NOTES ON BOOKS

THE GOOD NEW DAYS. By M. and C. H. B. Quennell. London: B. T. Batsford Ltd. 6*s*.

What an incredibly big advance a book like this represents beyond books of a generation ago, called "The Romance—of This or That." Mr. and Mrs. Quennell are extraordinary people. One cannot resist their faithful optimism. Their works are among the best all-round handbooks of education printed in the English language.

This is not a book for children, but all children from fifteen on might read and enjoy it. But stay—the publisher's "blurb" suggests that it *is* to a certain extent meant for children. This error of mine seems to me to indicate a special virtue in the authors. I believe it was a virtue in the great Po Chü-i that he read his poems to an old peasant woman and altered any expression which she could not understand. Mr. and Mrs. Quennell, anyhow, treat of grown-up things with the childish simplicity which is what is lacking in the technical jargon used by most grown-ups, for the most part unnecessarily.

The book is about the modern world: its methods and its aims. The world is really more preoccupied with the former, but Mr. and Mrs. Quennell try to redress the balance. They are, in a way, functionalists—one may start by feeling they are so too much. But no, see page 65: "How far is it right to take an intelligent boy and force him with a kind of economical shoe-horn into some dismal occupation for the rest of his life? 'Ah,' say the enthusiasts, 'accept the machine gladly—swallow the pill, or kiss the rod, and all will be well and there will be leisure for all.' But for what? To do fretwork, or some other absurd occupation?" These are almost the exact words of the sage William Morris—only instead of "fretwork" he put oratorios—endless attending of oratorios. That, he felt, would never do.

Our authors are functionalists with some reservations. They see the life of the individual too much as a whole for them to go to extremes. They see the life of the community as an all-round sort of life. Everyone in Australia is not to grow sheep, and everyone in England to make motor cars, just because this may be economically, or financially rather, most profitable. It is typical of them that although they urge that English agriculture should be to a considerable degree mechanised, room should be kept for the smallholder. By the way, their chapter on agriculture is particularly good and informative; enough to make any boy want to go off and farm with Mr. Bayliss or Mr. Brown or Mr. Hosier, and drive not an engine or racing car, but the Bomford midget tractor-with-cultivator.

The next chapter is an architect-making chapter. He who has not been claimed by the Bomford midget will want to be another Ebenezer Howard. (But some of us may feel more tenderly than the authors about Fig. 65, a piece of "nineteenth-century ostentation" which is held up for ridicule.) Chapter four, however, is not calculated to send any young enthusiast to the City, to speculate in pepper; nor will

the following one, though perfectly fair, be likely to beat up many recruits for the moving assembly line. The historical summary to this chapter is fascinating. All the same, the authors have the courage (and sense) to end with the words : " For ourselves, we think that the men who could solve the problem of the 2,000,000 odd unemployed would do better work than those who seek to save time."

The figures under " Social Habits " are well chosen. The end is as good as the beginning, which will satisfy most readers, though Dr. Johnson wanted the end always *better*. A splendid book, ridiculously cheap at six shillings. P.B.

SELF AND PARTNERS. By Sir Charles Holmes. London : Constable & Co. 18*s*.

" No splendid adventures," Sir Charles begins, " . . . like those of Cellini, Haydon, or my friend Rothenstein can brighten these pages." Descended from Charlemagne, perhaps, he was to be a different sort of paladin from Roland, but still a paladin, a champion, a defender of the faith of artists.

More distinguished Englishmen in the last three and a half centuries have been the sons of parsons than have been born to tinkers, tailors, soldiers, sailors or followers of any other profession. Sir Charles was the son of a parson, a man who took orders in 1857 and went to work in the slums. In Limehouse the Reverend Charles Holmes met Miss Mary Dickson, niece of his vicar, whom he married and who became the mother of our autobiographer in 1868.

The first part, no less than the later parts of this very personal book, is attractive because of the unassuming and yet animated, generous spirit that is clearly true to the writer's type, and that is breathed by every page. The whole, of course, is also a document, because Sir Charles Holmes, besides meeting and being connected by family, in business and in art with many well-known people, himself has played an interesting role as a servant of the public. He is related to Rivingtons, who were famous publishers ; Clutton-Brock was a friend of his at Eton : Ricketts and Shannon took him up when he was a young man facing life in London ; and he worked under Roger Fry on the *Athenaeum*, and was Slade Professor at Oxford, and twice Director of the National Gallery.

There was, and is, nothing immobile in Sir Charles's make-up. Fisherman, bruiser, civil servant and painter, he made many friends and got into no grooves. He was always normal, though it would be absurd to think of him as in the least average. He was ready to try things which might have broken another artist's heart. Even if his un-snobbiness is a little studied, here and there, he was obviously always an independent person. Not that he never imitated his favourite masters in his early Chelsea days, when he became, he charmingly avows, " a dull and rather gloomy little painter, relying unwisely upon raw umber as a general medium for fusing more positive colours . . ." He learnt to do better ; he developed his own vision ; he is represented to-day in many public collections, not only in the United Kingdom.

His chapters dealing with the National Gallery are fun, and of historic interest. He tells us about some acquisitions. The enchanting *Nativity* by Geertgen Tot Sint Jans was brought along by a visitor, in an attaché-case, in which the picture lay wrapped in a silk handkerchief. Sir Charles has a grand account of how a good many of the most valuable pictures in the Gallery were taken for safety into unused Underground stations towards the end of the war, when it became known that German bombs had made great strides in deadliness. He has something to say about the Lane bequest. And about politicians, and Treasury people, and great ladies ; and how he was late for dinner with the Queen ; and how he tried to teach

Mr. Winston Churchill " the value of a scale of tones " in constructing a picture. " But he, very naturally, preferred his own way of going ahead . . ." One day in the National Gallery Sir Charles met Mr. Max Beerbohm by chance, and " Max " asked " in his whimsical way why I did not give up my official life and write something more like ' The Tarn and the Lake.' " In this book Sir Charles had exposed his passion for fishing ; it not only impressed Mr. Beerbohm, but was quoted at length by Mr. Eric Parker in his " Angler's Garland." Who shall say that Sir Charles had not had a full, satisfying sort of life ?

The book is illustrated, but only two reproductions of the author's work are given, and they are caricatures : we ought to have had some of his north of England pictures.

PLATINUM

The recent publication by the Mineral Resources Bureau of the Imperial Institute of a booklet on Platinum and Allied Metals* serves a useful purpose in drawing attention to many facts connected with this metal which has now become essentially an Empire product, since it has been developed as a by-product from the Canadian nickel and copper refineries working on the ores from the Sudbury basin. The concentrates are obtained from the carbonyl process which involves no serious loss of precious metals.

Native platinum was first discovered in Columbia, but as it was very difficult to work, very little interest was taken in it for centuries. One of the earliest recorded uses for it was for counterfeiting Spanish doubloons between 1730 and 1772. About this time it was known as Platina del Pinto and it reached England under this name in 1742.

Thorpe's Dictionary tells us it was discovered in 1741 by Mr. Woods, an assayer in Jamaica, and that in the same year Sir William Watson, an English physicist, received some grains of the mineral from Jamaica and first described it as a new metal in 1750. The discovery of platinum in Russia was in 1819. From 1825 to 1845 the Russian Government absorbed all the output for their coinage. A heavy fall in the price on the open market occurred when such coinage was discontinued.

Platinum is of special value in the laboratory on account of its high melting point and resistance to most chemical reagents and to heat : the student first handles it as a crucible.

At the close of the eighteenth century, attempts were made by Jeanety, a working silversmith, to make platinum crucibles by igniting an alloy of platinum and arsenic and hammering up the mass of malleable platinum thus left—but the metal was too impure to be satisfactory. The basic method of refining platinum was worked out by Thomas Cock between 1800 and 1808, though it was afterwards commonly known as Wollaston's method, as he described it in an improved form in his Bakerian lecture for 1828.

Messrs. Johnson & Matthey were the first firm to engage in the platinum industry as a commercial enterprise. To-day they refine the South African production, which amounted to 35,000 oz. in 1935 ; in addition large quantities of payable ore were developed. The Canadian concentrates are refined at Acton, where the capacity is equivalent to 300,000 oz. per year, and marketed by the Mond Nickel Company :

* Published by the Imperial Institute 1936. 3/- net.

this quantity exceeds that of all other countries together, so that platinum from being a Russian monopoly has become essentially an Empire product.

The other platinum metals are not so well known; palladium, the first to be separated, was named after the asteroid Pallas; rhodium takes its name from the Greek *rhodon* (rose) in allusion to the rose-red colour of its salts; osmium is also named from the Greek *osme* (smell) since its volatile oxide has a penetrating odour; iridium, whose salts display different colours, takes its name from the Greek *iris* (rainbow); finally, ruthenium is derived from Ruthenia, an old name for Russia.

Now that most of these can be produced in some quantity and at a reasonable price, a thorough investigation is taking place to find industrial uses for them in which their remarkable chemical and metallurgical properties can be turned to best advantage. There is little doubt that such uses will multiply in the near future.

For some years, particularly during the period of post-War prosperity, the chief outlet for platinum was in the jewellery trade, where its high price stimulated popularity. It doesn't tarnish, is easily worked, and has many other qualities and it continues to a large extent to replace gold.

More serious is its use for various chemical and electrical purposes which need not be enumerated: it is of interest that during the last year or so the amount used in the industrial arts has exceeded that used for jewellery. Some of the other platinum metals, particularly rhodium, are coming into use for electro-plating. This gives a pleasing, uniform and non-tarnishing coat with a high reflecting power.

E.F.A.

GENERAL NOTE

Council for the Preservation of Rural England

Ninth National Conference.—The Ninth National Conference for the Preservation of the Countryside will take place at Torquay from October 8th to 11th. The Conference Headquarters will be at the Imperial Hotel, and the Sessions will be held at Electric House, Castle Circus. There will be two Sessions: Friday morning, October 9th, 10.15 a.m., The Rt. Hon. Sir Halford Mackinder, and Mr. Wesley Dougill, M.A., A.R.I.B.A., A.M.T.P.I., on "Coastal Preservation"; and Friday afternoon, October 9th, 2.30 p.m., the Chairman of the South Devon Regional Planning Committee (Councillor W. Denis Thomas) on "Development in Rural, Semi-Rural and Coastal areas, with special reference to the Design and Siting of Buildings and the Preservation of Amenities." On Friday evening, October 9th, arrangements will be made for an informal discussion and an exchange of views on general matters at the Imperial Hotel. On Saturday, October 10th, a tour of the Borough will be arranged by invitation of the Torquay Corporation, followed by visits to Cockington Hall and Dartington Hall; and on Sunday it is proposed to arrange a tour of the South Devon Regional Planning Area.

The Conference fee is 5*s*., to which the cost of meals, tours, etc., is, of course, extra.

A cordial invitation to the Conference has been extended by the Council to all Fellows of the Society, and further information and application forms may be obtained from the Secretary of the C.P.R.E., Mr. H. G. Griffin, 4 Hobart Place, London, S.W.1.

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

NOTICE

OPENING OF THE 183rd SESSION

The opening meeting of the session will be held at 8.30 p.m., on Wednesday, November 4th, when the Inaugural Address will be delivered by COLONEL SIR A. HENRY MCMAHON, G.C.M.G., G.C.V.O., K.C.I.E., C.S.I., Chairman of the Council. The subject of the address will be " One hundred and eighty years of pioneer work by the Royal Society of Arts."

After the delivery of the address the Society's silver medals awarded for papers read last session will be presented.

INDIAN ELECTROCULTURE: PROGRESS, PROSPECTS AND SERVICES IN INDIA AND ABROAD

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INTRODUCTION

In the course of the discussion of the lecture on *New Methods in Electroculture*, delivered at a special meeting of the Royal Society of Arts on November 16th, 1933, very useful and constructive criticism was offered along three lines. Expecting practical results for agriculture, Sir Douglas Newton had observed that large-scale experiments were needed if the conclusions reached in the lecture were to be of any use in the advancement and development of agriculture as a whole. Then, considering the main interest of the subject as chiefly academic, Mr. F. E. Rowland of the Agricultural Department, General Electric Company, had urged that efforts

should be made to carry out further tests on a practical scale to investigate the commercial possibilities of the lecturer's methods. And finally, while mentioning the decision of the special Electroculture Committee of the Ministry of Agriculture (to go back to pot tests to try to solve some of the problems which they could not solve in the field), the Chairman, Mr. R. Borlase Matthews, of the Council of the Royal Agricultural Society, had suggested that the lecturer should prepare a small, simple statement, explaining in a practical manner how people could experiment with the methods he advocated.

These lacunæ have come automatically to be filled in a degree which has exceeded all expectations during the development of Indian electroculture in India and abroad.

Procedure

The *modus operandi* was imposed by circumstances, varied and expanded by necessity, but justified by success. For want of a better, Mainpuri, a poor, obscure and backward district, was chosen as the seat of operations, and a modest Electroculture and Fruit Growers Association was set up, consisting of gentlemen farmers, landlords and dilettanti, who were afflicted with dying gardens and whose great concern was to save them from the axe in a double sense. These amateurs readily applied the new electrocultural methods, because they were simple, cheap and effective ; they registered success, and as the methods became still more cheap, simple and effective, they went on from success to success ; and finally they helped in a pioneering way to lay down the broad sound lines of a general technique which could easily be repeated anywhere under the sun.

The Association, or to use its popular name, E.F.G.A., made it its business to give *prompt* publicity among the people that mattered to the results that were coming in, in the shape of a series of so-called *Fulgura Flecto* leaflets, which is now reaching its double century. No wonder then that within a very short time of its inauguration, the E.F.G.A. had active members promoting practical research from Peshawar to Bombay and in Ceylon, Malaya, Sicily, America, etc. Their results were published separately or jointly, but always very promptly.

Three months after the birth of the E.F.G.A. it held a fruit show, with very gratifying results. These have been published as *Forward Steps in Modern Fruit Culture : Album of a Fruit Show*, the Electroculture Section of which is as follows :—

> " (In the following list E=energised ; C=control. Energising is done by wire netting, any special method used being mentioned. Measurements are in centimetres.)
>
> PLANTS. *Maize*—E, 75 ; C, 34.
>
> *Zinnia*—E, 48 ; C, 20.
>
> *Citrus* plant affected with wither-tip, cured by treatment, fruit still growing, measures 4 x 3·8.
>
> *Mango* seedlings killed by frost. Controls are dead, but the treated

revived, E, 65 ; C, 40. *Baby mango graft*—this is a small graft bearing big fruits, 5 x 4·5.

Groundnut—E, 23 ; C, 14. Germination is also remarkable : ten out of ten in the treated bed, as against five out of ten in the control.

Sugarcane affected by smut has been cured by treatment for a few minutes with a cycle lamp dynamo. The plant is quite healthy and has grown to a height of 110.

FRUIT PRODUCE—*Pumpkins*—E, 105 × 28 ; C, 75 × 18. E is healthier and more attractive in colour.

Lemons—E, 3·3 × 2·9 ; C, 1·3 × 1.

Papaya—E, 8 × 4·5 ; C, 7 × 3·5.

Mangosteen—E, 5·5 × 5 ; C, 4·5 × 3·5.

Mangoes—(1) Ungrafted : big bunches of twelve from the treated tree as against small bunches of five or six from the control.

(2) Grafted : the following choice varieties : Safeda—E, 10 × 6·5 ; C, 9 × 6. Ajuba—E, 16 × 9 ; C, 7 × 3·5. Dasehri—E, 12 × 7 ; C, 9 × 6. Khas-ul-kas, 14 × 11 ; C, 11 × 7. Bail—E, 11·5 × 10 ; C, 9 × 8.

Pomegranate—Special case of fruiting in one year, due to treatment. Control is fruitless. E, 8·5 × 7 ; C, nil.

Grapes—Bunch of grapes measuring 1 × 1 each raised as a second crop on poor *usar* land when the first had already been found satisfactory by official experts.

Citrus—Orange : E, 6 × 5 ; C, nil.
Bijora : E, 9·5 × 6·5. C, nil.
Pomelo : E, 11 × 10 ; C, nil.

Jamun—E, 2·5 × 2·2. C, 1 × 0·9. Special treatment with electrified water was given to other jamun trees with remarkable results.

Figs—A baby plant one year old was treated and it bore thirty fruits which, however, did not mature after reaching a size of 2 × 3. Then electrified water was given, with the result that the fruit matured to double the size with a beautiful violet colour. The fruit was very sweet and the meat no less than the skin tender.

Mulberry—Harvesting out of season. One branch alone was treated, with the result that it was laden with fruit measuring 6·5, while the remaining branches kept as control continued fruitless.

Sweet lime—Grown out of season with treatment."

So far, so good ; but all this was only a success of sorts, in name more or less, a *succès d'estime*, which could not grow to full success unless and until the bulk of the poor peasantry, comprising all the farming masses and classes at once, could be interested, their interest sustained and exploited and their husbandry definitely improved with electroculture. E.F.G.A. had to become a means of *rural uplift.* How did it rise to the occasion ? By insisting on fruit culture. Let there be no misunderstanding. Fruit was not needed as a Lucullan luxury, by way of *hors d'œuvre* or dessert, but as a vital necessity itself. How ?

The Indian farmer grows two crops in the main, a coarse one for food and a fine one for cash. The latter is at the mercy of factors beyond his control. In no

country in the world is agriculture *as such* a paying proposition, divorced from subsidiary cultures, and the Indian farmer with his acre farm, starved stock and poor means, physical no less than financial, belongs to the world's C.3's. So he was advised to try a side culture, that of fruit. Special stress was laid on papaya, plantain, guava and citrus. And with fruit went vegetables. Of course his farm and homestead were ridiculously small, but even so he had waste spaces and these could be exploited. For example, these fruits would thrive in the drains of houses and in wells. There would thus be a triple gain :—

(1) All the foul water and other filth would be used by the plants avid of water and manure, and this would rob bacteria of breeding grounds, improve the sanitation and make for rural uplift ;

(2) Useful fruit crops would be grown by the way, without incurring any trouble or expense over farming operations ; and, finally,

(3) The ill-nutritioned farmer would be able to put more and more varied food into his larder, more vitamins into his diet and more cash into his coffers by converting his perishable surplus fruit into achars, chutneys, jams, marmalades, crystallised fruit, sherbets and the like.

So the E.F.G.A. came out with telling slogans, such as "If Agriculture fails, try Fruit Culture"; "Fruit is Money"; "Fruit is Health and Wealth"; "With Electroculture grow more Fruit, better Fruit, early Fruit, late Fruit, exotic Fruit." And to these fine ends several practical steps were taken. A Fruit-preserving Exhibition was held, with hundreds of exhibits, the best, simplest and cheapest of which were awarded prizes, and their recipes broadcast. A Central Nursery was set up adjoining the President's Botanical Garden and arrangements were made with individual working members of the E.F.G.A. to distribute seed and stock to their fellow villagers. And finally, but fundamentally, advantage was taken of Sundays, holidays and festivals to hold Electroculture Shows all over the rural area, at which electrocultured produce from far and near was assembled, judged and crowned with prizes ; hundreds and thousands of strips of wire netting to serve as radiomagnetic jacketing were given away to such farmers as were impressed by the amazing exhibits (for *seeing is believing !*) and freely offered to apply the new methods ; arrangements were made for the free supply of electrified water ; a travelling circus of electrocultured plants and produce from the finest gardens—*hors concours*—was sent by lorry from show to show ; demonstrations were given ; questions answered ; and difficulties, technical no less than agrarian, removed on the spot. No wonder then, that in the course of a very few weeks the number of exhibits increased from tens and scores to hundreds and thousands.

Progress

The above procedure led to good progress, as evidenced by the electrocultured produce exhibited, fruits, flowers, cereals, vegetables and industrial crops. Farmers were learning the lesson and trying to show that electroculture was a paying commercial agrarian proposition. And now followed two developments, unfore-

seeable and unforeseen, which extended the field of electroculture out of recognition and invested it with world-wide importance as an aid to general husbandry, applicable to plants, animals, and humans alike.

As explained, the Indian farmer and his stock are the poorest in the world, and the amount of human and animal suffering to be found in the Indian countryside beggars description. The facilities that exist, with an average for a thousand villages of six clinics for the former and three for the latter, do not even touch the fringe of that suffering. " Have more clinics " is easier said than done, for money is scarce and no relief can be given without money. And yet the Indian farmer, thanks to electroculture, has performed that miracle.

Twelve thousand chronic, hopeless cases have been relieved with success, and have all been serialised, indexed and analysed, groupwise, agewise, sexwise in a publication of the Devi Fair Rural Uplift Movement, Mainpuri, directed by the President of the E.F.G.A. and called *True Rural Uplift Educator*, to which the social worker no less than the curious may be referred.

The second development, the extension of electroculture to animals, appears quite natural and inevitable in comparison. Farmers who turned for relief to electroculture for themselves were all the more prone to seek it for their animals. The first instance however was that of an European poultry breeder of Pilibhit, who actually cured a black Minorca fowl of tuberculosis by treating it with electrified water for three days, at the end of which time it was restored to the healthy flock after several weeks of segregation and languishing. But a wide variety of other animals came to the President's travelling electro-clinic. Within one month, eighteen horses and mares, one elephant, three camels, two dogs, three cows, six poultry, eleven bullocks, twenty-one buffaloes and one goat had been cured or relieved, and these too had been hopeless, incurable cases, which the local veterinary surgeons had not been able to put right. The technique is explained later. The total soon rose to be 300.

Thus the E.F.G.A. had very soon become a centre of relief for plants, animals and human beings. Landlords and farmers, villagers and townspeople, officials and non-officials, were all trying out the new methods and electroculturing themselves or their animals or their plants.

Technique

The following methods are brought to notice :—

Plants—(1) *Radiomagnetic.*—Seed is sown in a bed provided with a sheet of iron wire netting, mesh ½ inch. For a plant or tree a jacket or apron is formed, 1 inch to 1 foot wide, depending on the girth. For individual branches of a tree a collar of the same wire netting is formed.

(2) *Preliminary treatment of seed before sowing*, either dry, by spreading it out in a thin layer on an insulated metal plate and then giving the plate a high-tension spark of, say, 2,000 volts for one minute and then sowing the seed *without touching* ; or wet, by soaking the seed

in electrified water in an insulated vessel for one or two hours and then sowing the seed without touching it, as before.

(3) *Agaskarising* the plant or giving it electrified water. Whenever a growing part is given such a mantle of electrified water, its growth is increased. This is much more than irrigation, which is watering the roots. Water is electrified by taking it in an earthenware container, placing it on a rubber mat, dipping one end of a high tension cable into the water while the other is hooked on to the ignition plug of a motor car and running the engine for a ¼ minute. A complete set of such pitchers containing as many as 100 gallons can be electrified at once by dipping one end of a wire into each, collecting and connecting the other ends together and then using a cable in the same way and running the engine as above.

(4) *Interculture* of the growing plant with plants which are rich in M-rays or Gurwitch rays or ultra-violet rays, like onions and other root crops.

(5) Combination of the above methods. Other radiations are also effective such as X-rays, ultra-violet rays, violet rays, etc., but the exposure should not exceed one minute as a rule.

Good results have been obtained on a very wide variety of plant species. The basic principle is that wherever there is cellular activity, there electrical energy is developed; and conversely, wherever electrical energy is applied, cellular activity is increased and better growth obtained. Electroculture is the science of securing this growth through the application of electricity by using suitable technique. In theory, as in practice, this applies to all biological specimens, plants, animals, human beings, alike. Hence through electroculture bad specimens can be made good, and good specimens better.

Animals—Animals in health and disease are treated in order to increase their efficiency or give them relief. The methods are :—

(1) Making them drink electrified water. They are shown a handful of grain in an earthenware basin and while they are eating it is submerged under water poured in from one side. They usually drink off large quantities at a time.

(2) Exposing the feed to ultra-violet rays, usually the sun's rays on an insulated plate.

(3) Electric activation of the glands, especially the thyroid, for one minute.

(4) Electric massage of the injured parts.

(5) Washing of inflamed parts, such as eyes, ears, gums, face, mouth, with electrified water.

Relief has so far been given to three hundred animals of many kinds, from elephants to poultry.

Human beings—Methods : (1) Electrified sleep on insulators, one under each bedpost. (2) Electrified drink. (3) Electrified food (exposing it to the morning sun

for an hour and taking rootcrops such as carrots, onions, radishes, etc.). (4) Electrified irradiation (inhalation and insolation). (5) Electric activation of the glands. (6) Washing with electrified water.

Relief has been derived by 12,000 cases. They included eye, ear, spleen, mouth, teeth, heart, lungs, wounds, sprains, rheumatism, gout, lumbago, skin affections in general, not excluding piles, and cancer and mental disorders, not excluding lunacy. Particular methods of treatment have been worked out.

PRACTICAL NOTES AND INSTRUCTIONS

(1) *Radio-magnetic treatment*—Galvanised iron wire netting such as is used for fencing chicken runs, poultry and other farms may be used—the older the better. The mesh may be from a farthing to a florin, although even bigger meshes may be useful. Once it is laid down the wire netting may be left *in situ*, unless it interferes with deep ploughing, when it can easily be removed and replaced. The depth underground may be from 3 to 6 inches or even more, according to the crop to be raised. In most cases the roots will strike through; where there is interference apparent, there may not be any actual loss.

Where produce is raised in a row or series there is no need to waste the wire netting and energy over the whole field; it may be laid just under the projected row in a band 6 inches wide and as long as the row. Where the produce is still further broken up or distanced in that row, then the wire netting may be laid in 6-inch squares along that row. This will be useful for shrubs, bushes, etc.

Where the produce is to be fruit borne by tall plants or trees, as, for example, citrus, then the wire netting may be applied as a collar or jacket to the individual plant or tree. The best way is to make the jacket to measure. With a tape measure off the girth of the plant or tree, then cut off a piece of the same length from the roll of wire netting, and finally wrap it found the plant or tree at the base, intertwisting and so binding the jagged ends face to face. This jacket is elastic enough and will expand to meet any normal increase in girth, but should it cut into the stem, it may be opened out and a small strip of netting inserted in the gap and fastened as usual.

(2) *Energised seed* must not be touched by the bare hand or it is sure to lose its energy. The best way to handle it is with a pair of rubber gloves. Great care should be taken to avoid loss of insulation, or the energy stored in the seed will be lost.

Soaking in electrified water is not the same as soaking in ordinary water. Where very large quantities of seed have to be sown, soaking in electrified water is the easiest way; but where quality or pedigree seed have to be raised, any of the above methods may be tried. It cannot be overstressed that every farmer should try to raise his own pedigree seed.

Should seed be attacked by insect pests, such as the pink bollworm in the cotton seed, then the best course is to spark the seed for half a minute on an insulated metal plate. This sounds difficult, but is easily done. Take any piece of metal

sheeting, *e.g.*, galvanised iron roofing; lay it on broken bits of glass or china or porcelain ware; take the spark from the high-tension sparking plug of a car or cycle or tractor by means of a cable; spread the seed in a thin even layer on the plate, and now let the spark jump a gap of say 2 mm. by holding the cable at that length from the plate and running the engine for that period of time. This will both vitalise the seed and destroy noxious insect life.

(3) *Agaskarising* may be done in five different ways, each simpler than the other: (1) with a portable dynamo, delivering a current of 110 volts or so and a violet ray electrode; (2) with the current from the town supply and the same electrode; (3) with the high-tension current from the sparking plug of a motor; (4) with a bicycle lamp or pocket lamp dynamo; and (5) with a small induction coil and dry battery. Care has to be taken that the high-tension current, however obtained, is led properly and accurately into the insulated water, which should not be handled after treatment. If properly bottled, agaskarised water can be kept for two or three days, but the tendency is for it to lose charge by leakage, as the air is not a perfect non-conductor.

(4) *Interculture* is of very great use, especially when backward or stagnant or dying plants have to be helped in their life-cycle.

(5) Combination of methods may be tried in special cases, the best being (1) with (3), or (1) with (2) and (3).

Animals will as a rule drink electrified water eagerly, the bigger the animal, the greater the avidity, and conversely, the smaller the animal the greater the need to open its mouth and pour the water with a cream jug down its throat. Special advantage can be taken of animal psychology in treating animals. Thus, if the operator wears a white helmet, then the animal comes to associate the relief given by the electrified water with the white helmet and allow the wearer to approach a paining part such as a hoof or leg with the electrode; otherwise it may kick out. In insulating animals, the smaller ones may be kept in the arm of the operator, while he stands on a rubber mat; the bigger ones may have their hoofs washed and dried, which will ensure a fair measure of insulation.

Theoretical Considerations

It is often asked: What does the radio-magnetic jacketing do? Briefly, it sets up a local electrical field. But this is not enough; more detail is wanted, and some tests have given such detail. Consider the following seven cases: (1) a bed of wire netting; (2) a jacket of netting underground; (3) a jacket of such netting overground; (4) a jacket of such netting partly overground and partly underground; (5) a collar of such netting on branches; (6) a bed of netting with one side raised several metres high to serve as aerial; and (7) a bed of wire netting with both sides raised several metres high to serve as a double aerial.

Comparative tests have given the same results in all such cases and better results than in the controls. The good effects of radio-magnetic jacketing may therefore be ascribed to (1) the earth's magnetism; (2) electro-magnetic energy; and

(3) cosmic rays, which would include (*a*) the slow cosmic rays and (*b*) the secondary radiations set up by the faster rays in the core and neighbourhood of the iron. Cosmo-radio-magnetic is thus the full name of this energy.

Agaskarising needs to be particularly examined in its theoretical aspect. It can be, as it has been, tested and demonstrated with the greatest facility under every condition and climate. Two points need careful noting: (1) the circuit is incomplete; and (2) the period of charging is only one second or so. Water so agaskarised or electrified is not particularly rich in, and does not owe its special biological properties to, oxygen or hydrogen or ozone. Again ions, anions, cations or other products of electrolysis are not present in any abnormal quantities to explain the above results. Both these possibilities are ruled out by the two points which have just been mentioned. So the chemist and physicist cannot explain the process or the effects of agaskarising. Water so treated is also presumably not "heavy water," although conclusive tests are in progress.

Agaskarised water is therefore something totally new and unknown. To understand it better, take a parallel from nature, the bursting of the monsoon in India. When, after the three burning summer months, the big monsoon clouds roll up, attended or preceded by duststorms, they are struck by flashes of lightning and then the rain so charged with high-tension electricity comes down in torrents. This sparked rain has properties which remarkably favour plant growth and which are artificially reproduced in the water agaskarised or electrified on the farm. The sparked rain answers both the tests laid down and completes the parallel: (1) the circuit to earth is incomplete ; and (2) the period of charging is only a few seconds, one to five seconds or so. Both waters benefit all biological specimens, plants, animals, human beings, and finally, both taste like distilled water.

It is certainly remarkable that there should be no physical detector for this agaskarised water and that recourse should be had to biological detectors. That is also the case where *electrified food* is concerned. The theory of this latter is very illuminating.

Onion roots were shown by Gurwitch as long ago as 1922 to emit a type of mild ultra-violet radiation, called mitogenetic or, after Gurwitch, Gurwitch rays, which caused an onion plant exposed to such radiation to grow faster than a control plant not so exposed. These rays were detected in many other sources, but it is significant that physical detectors did not always give good results, whereas biological detectors invariably did. This is largely responsible for the polemic that has clouded the subject. But members of the E.F.G.A. were successful in showing that many rootcrops such as carrots, radish, turnip, etc., had the same property of emitting mild ultra-violet rays or G rays. True, such rays have not fogged a photographic plate so far, but the real reason is that the plate is not sensitive enough, and not that the rays as such do not exist.

This pure theory can be proved with an example from nature. The tulsi (*Occymum sanctum*) is a sacred plant to be found in every Indian household as the palm or fern is found in European homes. Now, when a palm begins to wither, the

housewife calmly replaces it with another; not so the Indian grandmother with the dying tulsi. It is bad enough omen that this sacred plant should be dying; to try and replace it would be worse. So she surrounds the stem of the dying plant with a few transplanted roots of onion, and the dying plant is brought back to verdure.

CONTACTS

The above is a clear instance of contact with workers in other fields, whose conclusions admit of an electrocultural theoretical explanation. There are many such, some of which will now be considered under appropriate heads:—

(1) *One-minute treatment*—E.F.G.A. methods have invariably adopted this norm, while orthodox workers have been assiduously treating for hours and hours and days on end, and then expressing surprise that their results should be conflicting. In the end they have declared electroculture to be a failure, while obviously it was their own technique, with exceptionally severe, if not lethal dosing, which had really failed. British reports, especially as recently as 1936, show this tendency, but there is no reason why it should be so, particularly when the British Ministry of Agriculture and Fisheries Memoranda for 1931–32 had notified results in which treatments of plants for over one minute had caused stunting, while those of thirty seconds had had a favourable effect. Huneke (in the *Deutsch. Med. Woch.*, 1935, lxi, 1514–1516) has shown that ultra-short waves applied for ½ to 1½ minutes free a local region from pain and also those at a distance in other parts of the body, so acting as an anæsthetic. These reflexes are due to electricity, not heat. But if too much electrical energy through strong and long dosing is introduced, then the excess over the infinitesimal requirement is rapidly converted into heat, which proves fatal to plants and animals alike. Thus, if mice, flies (according to Schereschewesky and others), etc., among animals and salvia, pea, etc., among plant seeds (according to Portheims) are exposed to the field of a short-wave condenser, they attain very high temperatures and are killed at once. It would be interesting, but not to the electroculturist, to know in cases in which treatment has been given for long periods of time, what noxious part the heat, into which the excess of electrical energy was transformed, has had to play.

Strictly speaking the orthodox worker who uses long, strong, repeated doses is deluded by two fallacies: (1) that because a treatment does good for one minute, it also does good for six hours; and (2) that because a treatment is good at one time it is good all the time, from seed to seed. The fallacies have only to be set forth in black and white to be rejected as illogical, and yet much of the work that has been going on in otherwise very advanced countries is marred by that error.

(2) *Night electric sleep* on insulators stands to reason; but an electric charge throughout the day on insulators does *not* stand to reason. A sufficient explanation is that the electroculturist will help, restore, improve, the natural functions of the biological system, but will on no account cut through them and impose an artificial one of his own by force. And yet that is what is being done by many researchers in

search of purely isolated reactions and results. Thus, this criticism applies to the excellent technique followed by Vles in his work on the behaviour of organisms electrically connected with, or insulated from, the earth. He quotes the results obtained at the Clinique Rohmer, when six normal babies were kept eight days insulated from the earth and six were not; and then *vice versa* for the next days. In the first test the growth curve of the insulated was very much steeper than the growth curve of the uninsulated; but in the next test made several weeks later, the above behaviour of the growth curves was reversed. Vles connects one phenomenon with a period of weak conductance of the atmosphere; the other with that of strong conductance of the atmosphere.

To the electroculturist, this abnormally long period of dosing, viz., eight days, is very deceptive and misleading. It would have been better to insulate the infants only during the times when they required sleep, and not otherwise. In any case Vles' results help to establish the basic fact that insulation has an effect on sleep. How to utilise it, is the practical business of the electroculturist.

(3) *Cosmic rays and cosmo-radio-magnetism* are interconnected, as explained earlier, through the phenomenon of secondary radiation, which is a consequence of primary radiation. Now this primary radiation may be very mild, as in the case of the ultra-violet M or Gurwitch rays; or it may be very strong, as in the case of cosmic rays. As to the former, that is how Gurwitch meets the objection that M or G rays should be very easily absorbed and should have no power to affect objects beyond a very limited range. As to the latter, Rossi divides cosmic rays into hard and soft, exactly as X-rays are or used to be divided, and while the hard can penetrate the thickest lead screen unaffected, the soft are absorbed completely by only a few centimetres of screening. So far nothing definite is known about the secondary radiation: whether it is totally contained in the primary, or it is generated by the primary, or both. All that is known is that the greater the atomic weight of the metal composing the screen, the greater the absorption of the secondary radiation. Thus, lead should absorb more than iron and iron very much more than zinc or wood.

Services, in India and Abroad

The E.F.G.A. has endeavoured to examine some of the problems concerning the cultivation of special crops in foreign countries in accordance with the wishes of its foreign members. A few such are noted illustratively below; but the actual number of foreign workers is, of course, very much greater. In fact, advantage was taken of a personal visit by the President of the E.F.G.A. during a world tour to give a demonstration and advice and special instructions to as many farmers, breeders, orchardists, ranchers, poultrymen, as well as university colleges, institutes, farms and other centres as requested him, and which he had time to visit. In consequence, over a hundred groups have been set up around the globe, to serve not only as centres and nuclei of electroculture, but also as models and exhibits of what can be achieved if the observer is desirous of trying out for himself the simple methods

so placed at his disposal. The *F.F.* leaflets are doing full justice to the work of foreign members ; here only a cursory view is taken :—

(1) *Malaya* has the terrible *Fomes Lignosus* scourge of its rubber groves. Electroculture has had particularly noteworthy success in overcoming the mischief wrought and already two *F.F* leaflets have shown not only that drying and dying trees have been brought back to new life, but trees condemned to be felled are actually giving more latex than the healthy ones. The cumbrous statistics will follow in a third leaflet. The system, according to the last report, dated August 16, is working very satisfactorily and the local planters and settlers are of the same opinion as the working member himself.

(2) *Ceylon* has had promising results. Advantage was taken of a few hours' stop in Colombo to visit a big rubber estate in Tabuwana at the owner's request. A few cases of affected rubber trees were treated on the spot and instructions given for the future. The results were so promising that the superintendent of the estate treated another thirty trees, six each of brown bast, *Oidium*, thin bark, *Fomes Lignosus* and tapping but poor yielding. The trees were all old, touching forty-two years, when quick results cannot be expected, and yet quick results have been obtained :—

1. Brown bast—Foliage healthier and latex flowing ;
2. *Oidium*—Badly affected trees denuded of foliage have developed new foliage, which has covered the dying branches.
3. Thin bark—Trees are very very old, results are awaited as the growth of bark is extremely slow in old rubber.
4. *Fomes Lignosus*—One was treated by the President on the spot, and five dying ones later by the superintendent. Two have improved in growth and foliage and the roots are showing signs of improvement.
5. Tapping trees—Foliage is better than in the surrounding untreated trees and the yield shows improvement.

The net result is that the superintendent has started the treatment of another 100 trees : 50 cases of brown bast ; 20 poor yielders ; and the rest *Oidium*, *Fomes*, and thin bark.

A further result of such live demonstrations is that a group in Neboda is showing keen interest and getting results with bast and another group in Ceylon is active.

(3) *Japan* is taking very special interest. At the request of the President of the Imperial Tokyo University, the President delivered an inaugural lecture and gave a demonstration on electroculture of plants, animals and human beings, the printed syllabus of which has been a practical guide for immediate work by numerous groups in many parts of the world, some 500 copies having been distributed to workers who offered to apply electroculture to their own practical problems. The most practical problem in Japan is the safeguarding of the mulberry tree from failure to leaf, which causes as much as 22,000,000 yen worth of damage in one year. Very fortunately the E.F.G.A. have already shown in their *F.F.* leaflet No. 20 how powerfully the mulberry responds to electroculture, so

much so that individual branches can be loaded with leaf and fruit at will. And in this, as in many other instances, the damage from frosts can be materially mitigated. Dr. Ando, Director of the Imperial Agriculture Experiment Station, is taking up the work.

(4) *California* evinced special interest, some thirty-five groups offering to apply the new methods, particularly after the demonstrations and practical tests which the President had to give by request at many places—ranches, farms, agricultural colleges and university centres, institutes, chambers of commerce, etc. All reports have not come in yet, but the following experiences may be cited by way of illustration: (1) In Reedley the hopper on vines was killed by shocks applied from the ignition of the ranch tractor. In another ranch fowl paralysis was tackled with success; the local paper *Reedley Exponent* reports as follows:—

> "At the John Pearl Ranch Dr. Nehru treated a white leghorn chicken that had been sick for several days. He poured half a cupful of electrified water down the throat of the bird without the slightest difficulty as it obviously enjoyed it. Within a few minutes Mrs. Pearl observed that the colour of the bird's crest had gone from a pale pink to a deep red and that it was pecking itself and others vigorously. Shortly thereafter it was difficult to distinguish the once sick bird from others of the same flock. Treatment was given to several flowers and vegetable plants at the ranch."

Mrs. Pearl's last received report is that her treated flower plants and tomatoes are much better than the controls and the treated bird continues undistinguishable from its fellows in the same flock.

(2) In Loomis, Mr. Teja has got excellent results without even the benefit of a personal demonstration, getting instructions by post. He reports thus: "I treated several of my chickens with electrified water, and all of them got well and we cannot tell them from the rest of the flock. . . . As for the experiment on vegetables, it worked wonderfully. Dozens of people have come to see it." He is expanding the work on to a 112-acre island.

(3) In Orange County a personal demonstration was given at the request of Mr. Howell on his ranch and a few dying oranges or those growing on poor soil were tackled. Within four days the response had been so encouraging that Mr. Howell proceeded to jacket 150 trees, the majority growing on sandier soil, but also some in the best soil. He was also applying scale control. The sick tree was looking greener and had been given a new lease of life. Interest in Mr. Howell's tests is gradually spreading throughout Orange County and if the results continue as expected, the benefit will be generally enjoyed there.

(4) In Northern California, Mr. Dobbins of San Francisco has undertaken extensive tests with almonds and cucumbers, after a personal talk and discussion with the President, but no demonstration. With respect to the cucumber seeds, he found the effect "*both immediate and definitely noticeable.*"

(5) In the *Spanish American States* interest was taken by individual growers, who, however, could be given no demonstration on the spot. Centres have been set up in Guatemala, Salvador, Columbia and in Havana, Cuba. Dr. Bonazzi, of

the State Agriculture Experiment Station, with Mr. Hamorski is himself carrying on various tests and is particularly interested in exploring the origin of electrified water, which might be analogous with " heavy water " in his view.

(6) In *Sicily*, the terrible scourge of the dry-rot of lemons called " Malsecco " is being tackled by Dr. Alosi, Director of the Technical Agrarian School, Messina. His experience may best be summed up in his own words, received from time to time, thus :—

> " Sopra 40 piante sulle quali venne artificialmente provocata la infezione di mal secco metà furono trattate con corrente elettrico et metà lasciate come controllo. Le piante lasciate come controllo si ammalarano tutte, mentre quelle trattate con corrente e busta radiomagnetica hanno dato risultato positivo in proporzione di 50%.
>
> A giacca o busta anche se unita alle scintillazioni 2000, 3000 volts non hanno dato alcun risultato positivo come mezzo curativo : le piante ammalate continuano nel loro corso fatale sino alla morte ; sulle piante ammalate se si provvede prima asportare tutta la parte ammalata con accurate rimonde l'intervento della giacca produce qualche effetto in quanto si nota che la pianta assume un maggior vigore e le foglie si fanno più verdi. Si e pure notato che le predette piante fino a questo momento non hanno subito una ripresa del male. Sembrerebbe quindi che i mezzi elettroculturali avrebbero una efficacia profillatica, riuscendo a prevenire infezione. Non si sono ancora occupato dell'applicazione del metodo con acqua irradiata o ionizzata."

Obviously radio-magnetic jacketing has preventive action, but agaskarisation will work curatively, as is done in many other troubles, and reports will be published as soon as received.

(7) In *England* many demonstrations have been given on plants and animals, while several human beings suffering from chronic troubles have turned to electroculture for relief. Tests have been started at numerous centres, even such as had not had the advantage of a personal demonstration on the spot, but relied on written instructions. Important farmers and others interested in the care and cure of animals have been interested and their results will follow as soon as available. But perhaps the most serious and pressing problem at present is that of grass sickness in horses, a disease which, in the words of the Parliamentary Under-Secretary for Scotland, " had so far baffled all efforts to deal with it and which had assumed alarming proportions in the north of Scotland this summer." During a special visit to the North, water has been agaskarised and its effect demonstrated, and it is hoped to apply electroculture therewith to the affected horses, which otherwise die off, as there is no cure.

(8) In *Germany* several centres have been set up especially in response to local requirements which ordinary methods failed to meet. Thus elms are afflicted with a malady which has a continental incidence ravaging trees as far apart as Berlin and Basle. These are fit subjects for tests and tests are in train. Again, during a demonstration it was found that plants such as roses, red currants, pears, plums, ornamental cactus, etc., were in need of attention and were electrocultured

accordingly. In one case four beech saplings were found growing fairly close together, two having double the size and girth of the other two. The puzzled owner could not explain the cause till it was pointed out: to protect the two saplings from a pet dog two had been given a jacket of radio-magnetic wire netting exactly as in electroculture treatment, which was therefore responsible for the better growth.

Some theoretical critics say that the effect of treatment is to stimulate the wood and the leaf into greater growth and to ruin the growth of fruit. What practical experience lies at the back of this is not known, but let the following extract from a report sent by an experienced German electrical engineer to the Kaiser Wilhelm Forschungsinstitut in Berlin (corresponding to Rothamsted) clear the point of all doubt. He joined the E.F.G.A. and applied its methods with great care, as was to be expected of a trained scientist and observer ; and his observations are, for greater exactitude, given in his own words :—

> " . . . Unter anderem wurden die folgenden Arten behandelt, zu bemerken waere aber dass zur Beobachtung der Ergebnisse die Kontrollpflanzen unbehandelt blieben.
>
> *Rotkohl*—Die Koepfe erreichten eine Groesse von 20 cm., dabei war die Guete der Frucht so vortrefflich, dass sie fast die unseres heimischen Rotkohles uebertrafen. Die Kontrollpflanzen entwickelten sich sehr langsam und ungleich, blieben auch in der Groesse und Guete ca. 30% zurueck.
>
> *Weisskohl*—Dasselbe wie bei Rotkohl, nur die Groesse der Koepfe reichte fast 25 cm., waehrend die Kontrollpflanzen sehr klein und unbedeutend blieben.
>
> *Blumenkohl*—Entwickelte sich zu einer Groesse fast wie der Weisskohl, aber schneeweissem, an manchen Stellen rosig angehaucht. Der Geschmack des Blumenkohls uebertraf tatsaechlich unsere heimischen Sorten. Die Kontrollpflanzen entwickelten sich anfangs ganz gut, blieben aber in der Groesse bei weitem zurueck, auch der Geschmack liess zu wuenschen uebrig.
>
> *Tomaten*—Entwickelten eine Fruchtbildung wie ich vorher noch nie gesehen. Jeder Zweig trug 6 bis 7 Trauben, mit ja 6 bis 7 Fruechten, die Stellenweise eine Groesse von 12 cm. erreichten. Ein Stuetzen der Pflanzen war unmoeglich, so wucherten sie auf dem Boden. Die Fruechte hatten eine blutrote Farbe und einen wunderbaren Geschmack, so dass sie mit Recht den Namen Paradiesapfel verdienten. Die Kontrollpflanzen entwickelten sich auch sehr gut, blieben aber in der Fruchtbildung weit zurueck und erreichten auch nicht diese Groesse und liessen im Geschmack zu wuenschen uebrig.
>
> *Franzoesische Bohnen*—Die Pflanzen erreichten eine Hoehe von 25 cm. entwickelten aber an Stelle eines dichten Blaetterschmuckes, fast nur Fruechte. Ein Stock allein gab einen Ertrag von 35 Fruechten von ca. 15 bis 18 cm. Laenge. Die Kontrollpflanzen blieben alle zurueck, entwickelten statt eines guten Ertrags an Fruechten, ein dichtes Laubwerk.
>
> *Suesse Paprika*—Die Pflanzen die nach der Saison gepflanzt wurden erreichten nur eine Hoehe von ca. 25 bis 30 cm., waren aber uebersaet mit Fruechten von fast 12 cm. Laenge und 6 cm. Dicke, mit sehr saftigem

suessem Fleisch. Die Kontrollpflanzen entwickelten sich wohl, zeigten aber gar keine Fruchtbildung, sondern die Blueten fielen ab.

Dieselben Erfolge erzielte ich mit fast allen anderen Gemuesearten wie Zellery, Zwiebeln, Petersilie, u.s.w."

(9) In *Switzerland* pressing problems are of two types: (1) how to produce better fruit where it does grow; and (2) how to grow fruit where it does not grow. Tessin exemplifies the first type; Arosa the second. At the former, very intensive tests are being made by a very keen fruitgrower who was deeply impressed by a demonstration and who now hopes to convert the C.3's into A.1's; at the latter strawberries, spinach, tomatoes, etc., have been treated on the spot and good results are anticipated, especially with strawberries, which have already given a surprisingly good response at much higher altitudes in the Himalayas in India, the earliest tests on which helped to establish the radio-magnetic methods. Further tests on a wide variety of fruit and flower plants are in progress at Basle.

(10) In *France* the position is unique. The tests of the eminent practical radio-biologist, Lakhovsky, have helped to confirm the work of some members of the E.F.G.A., and *vice versa*. Though the technique in the two cases is somewhat different yet both rely, finally and fundamentally, on, *inter alia*, cosmic rays and both have arrived at results which are *almost* identical in regard to dosage, time, treatment, response, everything. Thus the radio-magnetic jacket or collar or apron of the E.F.G.A. is replaced by the Lakhovsky bracelet, which has given substantial relief to human suffering in a very wide variety of cases. Both have effective variants on that prototype, and use them with success. Again, agaskarised water finds a very close parallel in its efficiency and its prophylactic and curative properties in the silver-ionised water prepared with the Lakhovsky stopper. More interesting than the ground common to both Lakhovsky and E.F.G.A. is, however, the ground which is not so common. Thus, while E.F.G.A. has been rejuvenating animals Lakhovsky has been aging wines and liqueurs, so compressing the work of years into hours. Another essential difference is that while Lakhovsky has open jackets, the E.F.G.A. has closed ones.

Conclusion

This paper will have failed of its purpose, if it (1) does not apply the proper stimulus at the proper place; and (2) it raises false expectations. The main object is to show that electrocultural methods as evolved and practised in India can be made to solve the local problems of other countries of the world, especially such as defy solution. The methods are extremely cheap, simple, harmless; this cannot be overstressed. But for that very reason they have to be applied with discretion and the reactions studied with care. Every worker should feel that he is his own specialist bringing his cultivation, his stock, himself on to a higher plane of existence. So the hopeless will find hope; the incurable, cure; the uncared-for, care.

And this is the True Uplift which every country needs.

CORRESPONDENCE

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International Symbolic Script

Greatly encouraged by Dr. Foat's generous comments in the *Journal* of March 14th last, I have since experimented with his suggestion of making the radicals of International Symbolic Script pronounceable, so that the " language " can be used, when so desired, for conversation and dictation, as well as for correspondence, the primary object.

At first I retained the initial letter classification scheme and inserted vowels between the consonants, but this had the effect of making it impossible to write the Script at a speed within the region of 100 words per minute. Next I tried making the radicals, for the most part, abbreviations of Latin and Teutonic roots. By this means the high speed of writing is still retained, and as Russians, Japanese, and even correspondence-minded Zulus, should not find it unduly difficult to memorise 452 pronounceable syllables—the total number used in International Symbolic Script to express every object and thought—the loss of the classifying principle may be regarded as not too serious.

I append the revised translation of the extract from Mr. George Bernard Shaw's " Saint Joan," and should be glad to hear from interested Fellows of the Society whether they consider the new form is preferable or inferior to the original Script word-forms as published in the *Journal* of December 20th last. The explanatory notes which follow the translation will, I trust, reveal the practicability of nationals of all civilised countries corresponding with each other freely within fifty hours, though ignorant of each other's native language.

You promised me my life ; but you lied. You think that life is nothing but not

v x prom j ji bi b v dicom v tin k bi e O b n

being stone dead. It is not the bread and water I fear : I can live on bread : when

e sto bim t e n l nutl & aq j bram j p bi z nutl q te

have I asked for more ? It is no hardship to drink water if the water be clean. Bread

j a qe f plu. t e n difa bib aq y l aq e net. nutl

has no sorrow for me, and water no affliction. But to shut me from the light of the

a n fem f j & aq n lesi. b g apo j go l lum d l

sky and the sight of the fields and flowers ; to chain my feet so that I can never

muno & l vi d l Disveg & Flo g libomet ji Ped s k j p ne

again ride with the soldiers nor climb the hills ; to make me breathe foul damp

re poru m l Milr ni tenas l Altv g ma j spi netoa aqi

darkness, and keep me from everything that brings me back to the love of God when

lumo & gar j go jet k zem j ba g l am d God te

your wickedness and foolishness tempt me to hate Him : all this is worse than the

vi bono & menfo trya j amo h al c e bem ki l

furnace in the Bible that was heated seven times. I could do without my

branteg i l bul k x e ka 7 ok. j x p fa mo mi

war-horse ; I could drag about in a skirt ; I could let the banners and the trumpets

mil-zola j x p presoa nyi i u vesmalu j x p le l Fabair & l Tubson

and the knights and soldiers pass me and leave me behind as they leave the other

& l Milbr & Milr moi j & ress j vom ki T ress l ut

women, if only I could still hear the wind in the trees, the larks in the sunshine, the

hou y on j x p omn aud l ven i l Arb l Avialt i l bril l

young lambs crying through the healthy frost, and the blessed blessed church bells

ju Zolan voc per l san glaci & l sanci sanci ecbui Musrunl

that send my angel voices floating to me on the wind. But without these things
k ze ji celr Voc poruaq g j z l ven. b mo C Ob
I cannot live ; and by your wanting to take them away from me, or from any human
j pn bi & mi vi ye gim Ob nyo go j o go je hoi
creature, I know that your counsel is of the devil, and that mine is of God.
bit j ke k vi v is ed l godo & k ji e d God.

Explanatory Notes on Effect of Single-letter Suffixes and Suggestion-compounds

–m and –o reverse the meaning of the radical to which either is attached, *e.g.*, *bi* life *bim* dead ; *bra* brave *bram* fear ; *fe* happiness *fem* sorrow ; *ze* send *zem* bring ; *am* love *amo* hate ; *be* better *bem* worse ; *lum* light *lumo* dark ; *bon* goodness *bono* wickedness ; *m* with *mo* without ; *ap* open *apo* shut.

–i expresses a related idea or the possessive case :—*les* injury *lesi* affliction ; *aq* water *aqi* damp ; *ny* near *nyi* about ; *sanc* divine *sanci* blessed ; *ho* man *hoi* human ; *glac* ice *glaci* frost ; *j* I, me *ji* my, mine ; *v* you *vi* your.

–i something outstandingly identified with the radical :—*nut* food *nutl* bread ; *bu* book *bul* bible ; *bri* shine *bril* sun.

–u the complement :—*por* carry *poru* ride ; *ho* man *hou* woman.

–a gives an unfavourable twist :—*pres* push *preso* pull *presoa* draf ; *dif* difficult *difa* hardship ; *net* clean *neto* dirty *netoa* foul ; *try* try *trya* tempt.

–r person :—*mil* war *milr* soldier ; *cel* celestial *celr* angel.

Suggestion-compounds provide new ideas by the joining of two radicals *di* say *co* correct *com* false *dicom* lie ; *dis* district or area *veg* vegetation *disveg* field ; *lib* free *libo* restrain *met* metal *libomet* chain ; *bran* burn *teg* cover *branteg* furnace ; *zo* animal *la* work *zola* horse ; *ves* garment *mal* male *malu* female *vesmalu* skirt ; *fab* fabric *air* air *fabair* banner ; *tub* tube *son* sound *tubson* trumpet ; *avi* bird *alt* high *avialt* lark *zo* animal *lan* wool *zolan* sheep ; *ec* ecclesiastical *bui* building *ecbuic* hurch ; *mus* music *run* rotund *musrunl* bell ; *por* carry *poru* ride *aq* water *poruaq* float.

Most Fellows of the Society will be aware that the Chinese Script represents every idea from no more than 214 pictograms.

Reginald J. E. Dutton.

GENERAL NOTES

Hyderabad Aero Club.—An Aero Club has been formed in Hyderabad to provide facilities for those interested in the sporting and practical side of flying. In a wider sense it is also intended to promote aviation and an interest in flying generally, and to bring the public into close contact with aircraft, and the operation of aircraft.

The Club provides a course of flying instruction and training for the Indian " A " Licence, and for the International certificates issued by the Aero Club of India and Burmah Limited. This certificate is recognised all over the world as evidence that the holder is a qualified pilot, but it does not entitle him to fly an aeroplane for hire or reward. For those who wish to take up aviation as a career the Club will do all in its power to help. The Club's machines and pilot instructors will be at the disposal of those who do not wish to become pilots themselves, but intend to take pleasure flights. There will, it is hoped, be reciprocal arrangements amongst all the flying clubs in India.

Arrangements are in progress for the construction of a club building on the most modern lines.

"Over a Century of Boiler Making."—An interesting sound film with this title, showing the latest developments in the building of Water Tube and Lancashire Boilers and High Pressure Fusion Welded Vessels, has recently been prepared by Messrs. John Thompson (Wolverhampton), Limited, and is to be shown in the Lecture Theatre of the Science Museum, South Kensington, at 4 p.m., on Friday, November 6th. Fellows of the Society are invited to attend.

NOTES ON BOOKS

Twentieth Century Ceramics. By Gordon Forsyth. London : The Studio Ltd. 7*s.* 6*d.*

Mr. Forsyth has set about writing his book in a good twentieth century way, not assuming too much previous knowledge of the subject in the members of his wide public, and trying to be clear both about technique and principles of design. He says at once : " Increased facilities and powers bring with them dangers and difficulties "—a true word. In art as in politics there is to-day an embarrassment—well, not of riches, but of possibilities.

There has been a cycle in ceramic art as in other arts. First came a need for increasing quantity of production, then for increasing quantity at cheaper rates, then for becoming up-to-date, then for easing up a little on principles and restoring spontaneity. The element of *fantaisie* has its place in modern pottery also, though many people will have to see before they believe—so degenerate had the lighter manifestations of ceramic art become.

One is glad to see that Mr. Forsyth holds up a warning finger at those who " make a creed of ' functionalism.' " He says " People who possess a good cup and saucer may wish to possess another cup and saucer, no better to use, but in their opinion better in appearance." Put simply like this, the point seems so obvious that one wonders there can ever have been any crude identification of beauty with " fitness-for-purpose." Still, Mr. Forsyth rubs it in (no more than one should do) that random artiness is no good. He shows us a cup embodying several bad functional faults : the lesson is needed by some housewives, but by some manufacturers as well.

In his preliminary survey the author covers the historical ground very skilfully. He acknowledges the importance of William Morris as the renovator of English craft—of pottery only indirectly through his association with William de Morgan. His estimate of both the success and shortcomings of W. R. Lethaby, founder of the D.I.A. is just. Lethaby followed Morris, but not far enough. Morris believed in ornament, and Mr. Aldous Huxley has conjectured that some of the recent reaction against it must be put down to morbidity in the public *psyche.*

After the text come nearly a hundred pages of photographs. They show a huge variety of ceramic utensils and objects of all kinds and from all quarters. Great Britain comes out well, chiefly perhaps because her best traditions have never been abandoned. The British best is generally very good, but the foreign second-best is more often more acceptable than our own. P.B.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

Monday, November 2..Electrical Engineers, Institution of, at The University, **Liverpool.** 7 p.m. Dr J. D Cockcroft, **"The Transmutations of Matter by High Energy Particles and Radiations."**

Engineers, Society of, at the Geological Society Burlington House W. 6 p m Dr B A Keen and G. H Cashen, **"Some Aspects of Cultivation and other Power Operations on the Farm."**

Farmers' Club, at the Royal United Service Institution, Whitehall, S.W. 4 p.m. Viscount Lymington, **"The Place of Agriculture in Home Defence."**

Geographical Society, Royal, Kensington Gore, S.W. 3 p.m. and 8.30 p.m. H. Ruttledge, "**The Mount Everest Expedition of 1936.**"

Mechanical Engineers, Institution of, at the Mining Institute, **Newcastle-on-Tyne.** 6.30 p.m. J. J. Denton, "**Television—its Physical Basis and Advance.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Don F. S. Cantón, "**Six Great Spanish Artists. Lecture I—Pedro Berruguete, Pintor.**" (In Spanish.)

At King's College, Strand, W.C. 5.30 p.m. Prof. Dr. R. W. Seton-Watson, "**Austria, the Habsburgs and the Empire. Lecture IV—The Recovery of Hungary.**"

At the London School of Economics, Houghton Street, W.C. 6.0 p.m. Prof. A. Plant, "**Current Problems of Business Administration. Lecture I—Centralise or Decentralise?**"

At University College, Gower Street, W.C. 5.0 p.m. Dr. R. J. Lythgoe, "**The Physiology of Vision.**" (Lecture IV.)

5.30 p.m. Prof. H. H. Bellot, "**The Place of American History in English Education.**"

TUESDAY, NOVEMBER 3..Electrical Engineers, Institution of, at the College of Technology, **Manchester.** 7.30 p.m. Dr. R. J. Reynolds. "**Cineradiography.**"

Manchester Geographical Society, 16 St. Mary's Parsonage. 7.30 p.m. W. FitzGerald, "**Impressions of Soviet Russia.**"

Photographic Society, Royal, 35 Russell Square, W.C. 7 p.m. J. E. Saunders, "**Some New Cameras.**"

Refrigeration, British Association of, at the Institute of Marine Engineers, 85 The Minories, E.C. 6.30 p.m. Symposium on "**Corrosion in the Refrigerating Industry.**"

University of London, at King's College, Strand, W.C. 5.30 p.m. Dr. W. J. Rose, "**The Cities of Poland: Their Rise and their Significance for the New State. Lecture II—Warsaw, 1800-1800: From Village to Cultural Capital.**"

At University College, Gower Street, W.C. 5.0 p.m. Dr. C. Reid, "**The Endocrine Organs in relation to Metabolism.**"

WEDNESDAY, NOVEMBER 4..Central Asian Society, Royal, at the Royal Society, Burlington House, W. 8.45 p.m. Sir C. Bell, "**Mongolia and Manchukuo.**"

Electrical Engineers, Institution of, at the Literary and Philosophical Society, Westgate Road, **Newcastle-on-Tyne.** 7 p.m. Dr. E. Mallett, "**Television—an Outline.**"

Heating and Ventilating Engineers, Institution of, at the Institution of Mechanical Engineers, Storey's Gate, S.W. 7 p.m. H. Bruce, "**Panel Warming Calculations.**"

United Service Institution, Royal, Whitehall, S.W. 3 p.m. Sir P. Chetwode, "**The Army in India.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Don F. S. Cantón, "**Six Great Spanish Artists. Lecture II—Machuca, Arquitecto y Pintor.**" (In Spanish.)

At King's College, Strand, W.C. 5.30 p.m. Rev. Dr. F. J. Hollis, "**The Influence of Religion on Architecture. Lecture IV—The Temple at Jerusalem (2).**"

5.30 p.m. G. Struve, "**Pushkin and the Golden Age of Russian Literature. Lecture I—Russian Literature at the close of the Eighteenth Century.**"

At University College, Gower Street, W.C. 5.15 p.m. Prof. Sir M. Amos, "**Select Topics in Comparative Civil Law.**" (Lecture IV.)

THURSDAY, NOVEMBER 5..Auctioneers' and Estate Agents' Institute, 29 Lincoln's Inn Fields, W.C. 7 p.m. N. E. Mustoe, "**Income Tax on Land.**"

Chadwick Trust, at the Royal Society of Arts. 8.15 p.m. R. R. Hyde, "**Industry's Contribution to Public Health.**"

Electrical Engineers, Institution of, Savoy Place, W.C. 5.30 p.m. Dr. T. E. Allibare, D. B. McKenzie and F. R. Perry, "**The Effects of Impulse Voltages on Transformer Windings.**"

Geffrye Museum, Kingsland Road, E. 7.30 p.m. A. K. Sabin, "**Medieval Wall-Paintings.**"

Mechanical Engineers, Institution of, at the Royal Technical College, **Glasgow.** 7.30 p.m. Prof. Sir T. H. Beare, "**James Watt and his Service to Engineering.**"

Metals, Institute of, at the James Watt Memorial Institute, **Birmingham.** 7 p.m. J. A. Jones, "**Present Trend in Alloy Constructional Steels.**"

University of London, at the London School of Economics, Houghton Street, W.C. 5 p.m. Dr. A. M. Wagner, "**The Development of German Cultural Institutions since 1918.**"

At King's College, Strand, W.C. 5.30 p.m. Dr S. J. Davies, "**Injection and Combustion in Oil Engines.**" (Lecture IV.)

5.30 p.m. Rev. Prof. G. Florovsky, "**Patristic Doctrine of Atonement.**"

5.30 p.m. F. Howes, "**Some Aspects of National Music. Lecture IV—English Folk Music.**"

At Royal Society of Medicine, Wimpole Street, W. Dr. W. Howarth, "**Some Tumours and Ulcers of the Palate and Fauces.**"

FRIDAY, NOVEMBER 6..Chemical Industry, Society of (Chemical Engineering Group), at the Royal Technical College, **Glasgow.** 7.30 p.m. Dr F. Singer and W. E. Speirs, "**Acid-Resisting Industrial Filters.**"

Engineers, Junior Institution of, 39 Victoria Street, S.W. 7.30 p.m. L. Friedman, "**Gas Engineering and its Application to Water Heating.**"

Engineers and Shipbuilders, N.E. Coast Institution of, at the Literary and Philosophical Society, **Newcastle-on-Tyne.** 7 p.m. Sir F. E. Smith, "**Sir Charles Parsons and Steam.**"

Heating and Ventilating Engineers, Institution of, at the School of Art, The Newarkes, **Leicester.** 7.15 p.m. Dr. T. Bedford, "**Warmth and Comfort.**"

At 312 India Building, Water Street, **Liverpool.** 7 p.m. A. E. Alexander, "**Commercial Uses of Gas.**"

Mechanical Engineers, Institution of, Storey's Gate, S.W. 6 p.m. Prof. A. Fowler, "**The Spectroscope and the Atom.**"

At Robert Gordon's College, **Aberdeen.** 7.30 p.m. Prof. Sir T. H. Beare, "**James Watt and his Service to Engineering.**"

Royal Institution, 21 Albemarle Street, W. 9 p.m. Prof. F. A. Paneth, "**The Chemical Exploration of the Stratosphere.**"

University of London, at Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Don F. S. Cantón, "**Six Great Spanish Artists. Lecture III—Diego de Siloe, Escultor y Arquitecto.**" (In Spanish.)

At King's College, Strand, W.C. 5.30 p.m. R. J. H. Jenkins, "**Modern Greek Novels.**"

SATURDAY, NOVEMBER 7..Horniman Museum, Forest Hill, S.E. 3.30 p.m. Dr. W. E. Swinton, "**Volcanoes.**"

EXHIBITIONS DURING THE ENSUING WEEK

MONDAY, NOVEMBER 2..(TO NOVEMBER 6) **Brewers' and Allied Traders' Exhibition,** Agricultural Hall..

(TO NOVEMBER 7) **Artist-Craftsman Christmas Exhibition,** Central Hall, Westminster. **Bicycle and Motor Cycle Show,** Olympia. **Imperial Fruit Show and Canners' Exhibition, Liverpool.**

(TO NOVEMBER 16) "**Sunday Times**" **Book Exhibition,** Dorland Hall.

(TO NOVEMBER 28) **Exhibition of Inn Signs,** 158 New Bond Street, W.

JOURNAL OF THE ROYAL SOCIETY OF ARTS

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All Communications for the Society should be addressed to the Secretary, Royal Society of Arts, John Street, Adelphi, W.C.2. (Tel. Temple Bar, 8274).

NOTICE

NEXT WEEK

MONDAY, NOVEMBER 9TH, at 4.30 p.m. (Dominions and Colonies Section). C. A. BERENDSEN, C.M.G., LL.M., Permanent Head, Prime Minister's Department in New Zealand, " Western Samoa " (illustrated by lantern slides). THE RIGHT HON. VISCOUNT BLEDISLOE, P.C., G.C.M.G., K.B.E., Governor-General and Commander-in-Chief of New Zealand, 1930–35, will preside.

WEDNESDAY, NOVEMBER 11TH, at 8 p.m. (Ordinary Meeting). F. H. SPENCER, D.Sc., LL.B., late Chief Inspector of the Education Department, London County Council, " Canadian Education: a Winter Visit." PROFESSOR F. CLARKE, M.A., Director, University of London Institute of Education, will preside.

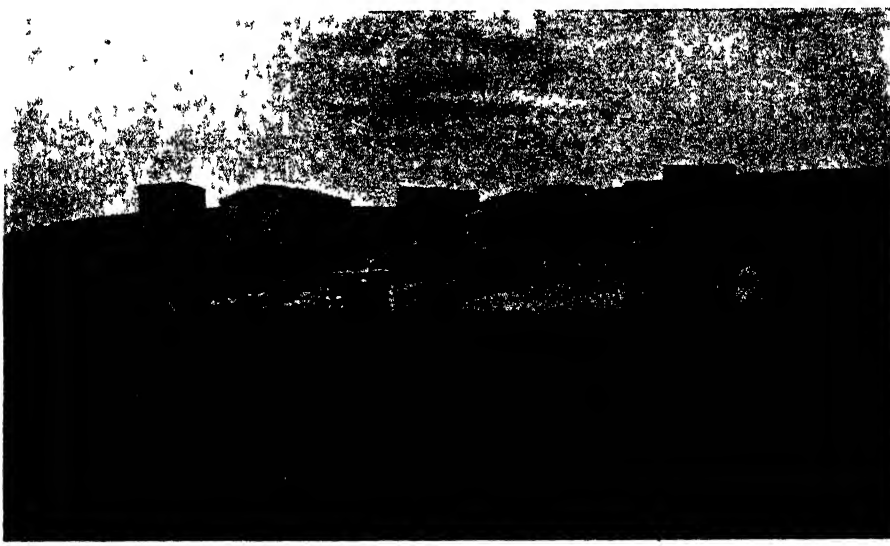
FRIDAY, NOVEMBER 13TH, at 4.30 p.m. (Indian Section). J. H. HUTTON, C.I.E., M.A., D.Sc., late Census Commissioner for India, " Head Hunters of the North-East Frontier " (illustrated by lantern slides). SIR EDWARD A. GAIT, K.C.S.I., C.I.E., will preside.

BLANC SABLON: A STUDY OF AN ISOLATED LABRADOR COMMUNITY

By O. W. JUNEK

In the Lower St. Lawrence region innumerable fishing villages have developed fringing upon the Gulf or the countless bays or inlets or river estuaries which empty into the St. Lawrence. It is almost needless to say that such natural geographic factors as these have determined largely the distribution of the population, and have imposed at the same time a considerable restraint upon

contact with the outside world. Clustered in rocky convolutions of the earth these little settlements present an aspect forbidding in the extreme—especially to eyes more accustomed to the happily sculptured configurations of certain sections of the continent south and east. On one side toss the cold, foam-flecked swells of the Gulf, or of the Atlantic ocean; on the other, swamps and bogs, terminating at the foot of hills or ridges of rock which rise to heights of about eight hundred feet, form what might aptly be called a backyard. There are relatively few settlements on the upland. Quite frequently promontories separate one village from its neighbour. Communication from one village to another is effected in summer and late spring by means of small water-craft; in winter,



THE VILLAGE OF BLANC SABLON, showing two of the "stages" in the foreground

late fall and early spring the *cométique* drawn by dogs is used. The paths leading over the mountains are used but infrequently, and then only in early fall and in winter, when the men foray north or north-west in search of firewood, or go hunting and trapping.

Four classes have been distinguished in Labrador—namely, the original French settlers, the fishermen from Newfoundland, the *Liveyère* and the natives, or Eskimos. The Newfoundlanders come in boats of all sizes and devious conditions, and, living under any makeshift structure, return finally to Newfoundland with their catch at the termination of the fishing season. The *Liveyère* is the resident fisherman, a Newfoundlander in origin. The Eskimo seldom comes south of Hopedale. But the crossing of breeds in Labrador is beyond investigation, and the part-breed Eskimo is everywhere.

The size of the Labradorian community depends almost wholly upon its strategic position as a fishing-centre and the relative calmness of its naturally-formed habour. The natural limits of the Blanc Sablon community are two short promontories jutting out obliquely on the west towards Longue Pointe, on the east towards Lance-au-Claire and the north-east portion of Labrador. These promontories obtrude into the sea, and, acting as arms, form a natural harbour. The Laurentian chain acts as a protecting backwall for the village, which is situated approximately half-a-mile south of it, and facing the sea.

Another community organised similarly within the framework of the foregoing physical factors is Brador (*Bras d'or*), situated about nine miles west of Blanc Sablon. Brador was a seigneury settled some three hundred years or more ago. Then, as now, fishing and seal hunting in the immediate waters were such lucrative pursuits that sailors out of Normandy and Brittany were able ultimately to return to their native shores with great wealth in catch, which they converted subsequently into gold. Hence the name *Bras d'Or*, or Golden Arm. When wars with England became common, the community was deserted finally by the old sailors, who returned to France after burying their treasures and gold coin for which they hoped to return some day, though they never did. To-day, Brador consists of only seven families. In the meantime (that is about seventy-five years ago) the people of the county of Montmagny (Berthier, St. François, etc.) and of Gaspé formed minor settlements around Brador both eastwardly and westwardly. Of these both Blanc Sablon and Longue Pointe are the later in point of time. Longue Pointe is the larger community of the two, and consists of twenty-three families. But Blanc Sablon, although made up of only thirteen families, seems to be the more important, and has many advantages over its more populous neighbour. Here is located a branch of the Hudson's Bay Company, and a small post office ; and here the Clarke Steamship Company's *Sable I* casts anchor every fourteen days during summer, discharging and picking up mail and occasional passengers—and thereby making Longue Pointe quite dependent upon Blanc Sablon for communication with or by steamboat, or for such urban influences as Hudson's Bay Company trading.

The more developed communities to-day, then, are these two—Blanc Sablon and Longue Pointe, Blanc Sablon being the easternmost, in fact, the last of the North Shore settlements, and situated about four miles south-west of the Newfoundland-Labrador boundary. The population of Blanc Sablon—from the first census taken by myself on July 15th, 1934—is actually seventy-eight people ; and that of Longue Pointe at least twice as many.

But although Blanc Sablon has a more direct contact with the city system than either Longue Pointe or Brador, Longue Pointe must be considered as the focal point for religious life of all three communities, for situated here is the Lourdes de Blanc Sablon, here lives the parish *curé*, Père Gagné, and here each Sunday come worshippers from Blanc Sablon, Greenly Island, and Brador. Longue Pointe and Blanc Sablon—and it is these two communities, particularly the

latter, in which we are interested—share therefore a mutual dependency ; for while the former is the centre of religious life, the latter is a centre in itself of contact with the city system.

Generally speaking, the winters are long and bitterly cold, and the summers short and somewhat mild—although the temperature rarely rises above fifty-five degrees Fahrenheit. Fishing for cod is, of course, the central or primary activity of the people living in this zone ; but hunting and trapping and the gathering of pineroots for fuel form likewise important activities when the fishing season has been brought to an end by the abrupt appearance of winter, which sets in about the end of October, and continues without respite almost up to the end of May.

The fishing season begins late in June. About this time capelin and cod begin to make an appearance in ever-increasing shoals. As the summer progresses, the capelin turn shoreward to " breach," becoming the prey not only of the fishermen —who utilise this fish for food—but also of the cod. The cod, while greedy feeders, are particular about bait. Capelin—a small fish resembling somewhat the sardine—smaller mackerel, clams and squid—a species of cephalopod—are eaten by the cod.

Cod fishing, interspersed by occasional salmon fishing, goes steadily on until about the end of July. By then *at least* ten tons of fish per family must be caught, salted and dried, or economic disaster occurs. It is at about this time that the dogfish—a small variety of shark—comes into the neighbouring waters, ending cod fishing. These fish not only drive the cod away but tear the meshes of the cod-traps with their sharp dorsal fins. The dogfish furthermore attack almost everything within sight, and the natives consequently stand in fear and hatred of it. As one informant has expressed this attitude, " Si vous tombez dans l'eau, vous êtes perdu ! " No doubt these fish really have the voracious habits of the shark, judging from their anatomical structure. With the appearance of the dogfish the folk turn perforce from cod-fishing, and begin to wash their season's catch and prepare it for drying on " flakes." Herring-fishing and the salting of cod occupy the community until October, when herring-fishing ends.

All though the month of October the men make repeated trips into the mountains with dog-teams to gather roots for fuel. The kindling must be in by the end of the month, for snow, beginning to fall about them, makes root-gathering virtually impossible. To the average male of Blanc Sablon this phasis of the annual socio-economic cycle is the least prepossessing, and it becomes even more of a drudgery as year succeeds year. The following statement from the lips of a Blanc Sablonite fairly condenses the attitude of the folk toward it. " It's getting the wood that is the hardest job ; getting fish is play ; and seal-fishing is real fun."

The months of November, December, January, February, March and a part of April are devoted almost exclusively to hunting and trapping many miles north of the village of Blanc Sablon. The animals caught are the fox, mink, muskrat and an occasional mountain-cat—a variety of lynx.

Hunting ends sometime about the end of March or the beginning of April.

During the second half of March seal are hunted openly on the ice floes. Throughout the latter part of April, and almost all of May, sealing is carried on by means of seal-traps which are placed under the ice.

Cod Fishing

Cod-fishing has already been mentioned as the outstanding or primary activity of the Blanc Sablonites. The fish are caught in trap-nets. A trap-net is a ponderous fabrication, the meshes of which are two inches square and made of twine one-sixteenth inch in thickness. It is about three hundred and twenty-four feet long, fifty feet wide and forty-five feet deep, and is set into the sea like a huge box. The edges—or head—are kept afloat by pairs of cork discs three and three-quarter inches in diameter, and one and one-quarter inches thick, strung on one and one-half inch rope at fifteen inch intervals. The bottom edges are weighted down by buttons of lead one and one-quarter inches thick and three and one-eighth inches in circumference, set at about fourteen inches from each other. A "leader" —or opening through one end into the trap—is another net two hundred and forty feet long, and of the same depth as the trap itself. At its inside end, however, the "leader" is only twenty-four feet wide, and is sewn into the trap. Once the fish swim inside this construction it is difficult for them to escape.

The trap-net is generally referred to as "gear," and is quite expensive. The Hudson's Bay Company post charges for it between three and four hundred dollars—or their equivalent in codfish. Net repairs are very frequent, since, if the entire net is not thoroughly dried after the termination of the fishing season, the twine rots. For this reason the folk dip their "gear" in tanning-bark solutions, which give the twine a greater chemical resistance. But in spite of tanning—or "barking"—the nets still get damaged and torn by salmon and dogfish, and the fisherman's home-made wooden needle is kept busy long after the nets have been set out to dry. During the winter the traps are kept in the "stages."

Several of the fisher-folk, who are unable to procure the regular fishing-gear, earn their livelihood by "jigging." A "jigger" is a leaden, troll-like decoy cut in the form of a capelin, and having two sharp hooks. A line is attached to it, and it is thrown overboard. Cod and other fish are caught by jerking the "jigger" suddenly up over the broadside of the boat. But this is a slow and laborious process at best, and not many fish can be caught in this manner. Those families who are forced to this extreme consequently look toward the day when they, too, will be able to afford trap-nets.

At sunrise, the weather permitting, the men and older boys of Blanc Sablon go out to the cod-traps, which are situated near the vicinity of Isle au Bois. Usually one motor-driven fishing-smack for each group sets out. Such vessels accommodate half-a-dozen people or more, and are, therefore, sufficiently large. Often, however, especially when a good catch is anticipated, another motorless boat is attached by rope to the first, and into both boats the cod are flung, being

taken out of the trap-nets by hand. A good morning's catch constitutes from one to one-and-a-half tons. This is the first operation—or division of the day's labour, and it lasts generally from two to two-and-a-half hours. The parties return before breakfast. The boatloads of fish are anchored temporarily at the wharves, and the fish are covered with sailcloth.

Breakfast is soon over. Back go the men to the wharf and boats. The fish are uncovered and tossed, still alive, from the boats to the wharf by means of a two-pronged pitchfork, to be later conveyed to a large box attached to one side of a large table some twelve feet away.

Each family group arranges itself round a table in the following manner: one member, the "cut-throat," reaches into the box, grasps a fish by its eyes and makes a lunar incision on its ventral side across the throat from gill to gill. He also makes a longitudinal incision through the belly of the fish, thus allowing the entrails to fall out. In this condition the fish is pushed to the next man, the "header."

He rips out the liver of the cod, dropping it into a special barrel under the table, tears off the head and tosses it, together with the entrails, over the side of the wharf into the shallows below, where the huskies are waiting to gorge themselves. He then pushes the headless and eviscerated fish across the table to the "splitter," who runs a square knife under the vertebral column of the fish lengthwise, cutting out the column on a return motion, and dropping the now shapeless mass into another barrel filled with sea water. This process is repeated over and over, until finally the entire morning's catch has been cleaned.

Very often quantities of salmon get caught in the trap-nets together with the cod. Whenever this occurs, the salmon are split over the dorsum, the head and the entrails are removed and the vertebral column cut out, almost the same as in the treatment of the cod. The pink salmon only, however, is reserved for human consumption; the white salmon, which are called "slinks," are either thrown back into the sea or kept as winter food for the dogs.

While the preceding operations have been going on, and without interruption, another member of the group makes repeated trips to the "stage"—a small shack where the fish are salted and stored—transporting the cleaned fish thither by wheelbarrow. He arranges the fish in rows belly-up on the floor, which has been previously scrubbed; and the last member of the group, who remains constantly in charge of the "stage," sprinkles the exposed fish with crude salt lengthwise through the centre. Layer after layer follows, and in this state the fish are left until they are ready to be dried upon the "flakes"—the last, and somewhat precarious, step of the cod-fishing industry.

Very little motion is wasted in these processes, none of which may be interrupted in its proper sequence until all of the catch has been disposed of—labour involving the handling of from one to one-and-a-half tons of fish. The blood and debris are then washed from the table and wharf, the implements are cleaned, and the men turn finally to various chores about the house.

Cod-Liver Oil

In so far as the folk of Blanc Sablon are concerned, the one and only important by-product of the cod catch is cod-liver oil. This oil, as it is produced in its crude primary state, is unfit for human consumption; and to be made so must first be refined by subsequent processes not engaged in by the Blanc Sablon people. As we have already observed, the liver is ripped out of the cod by the person who does the "heading" and dropped into a special barrel at one side of the table upon which the fish are cleaned. When this barrel is full of livers, its contents are dumped into a larger barrel. Left exposed to the sun and air the liver eventually decomposes; the stroma sinks to the bottom; and the oil rises to the surface. This is essentially what we know as cod-liver oil, though in an unrefined state; the folk, however, refer to it simply as cod oil. At the end of the fishing season—about the 15th of August—the oil is drawn off, poured into regular oil barrels and sold. One barrel contains about fifty gallons of oil; and a family engaged in cod-fishing averages about two barrels a season. In 1933, the price fixed for one gallon of cod oil was ten cents; in 1934, the price obtained (in trade) ranged from thirty to thirty-five cents a gallon.

Washing of Cod

During the month of August three activities usurp the time and attention of the folk; the washing and drying of cod; berry picking; and herring-net repairing. The most important of these occupations is naturally the washing of the salted cod, which has afterwards to be dried on the "flakes." This activity is begun sometime about the middle of August, and continues on more or less regularly until the 1st of September.

Bad weather in August always threatens the community with economic disaster, for lightly-salted cod, if not washed and dried, soon becomes invaded by maggots, and the work of a whole summer in consequence goes to waste. For several years back the weather after August 15th was so immoderately rainy and foggy that the salted fish could not be placed out on the "flakes." In 1933, in order to prevent a recurrence of this several fishermen washed their entire summer's catch in heavily-salted water—or "pickle"; but even this precaution did not help very much, and the cod became slimy and unfit for marketing. The folk must be perpetually alert to spread their fish upon the "flakes" as soon as the sun begins to shine, gathering and piling them into heaps, and covering them with heavy sailcloth at the slightest indication of rain or fog. This activity may be compared with some of the difficulties encountered by the American farmer during the hay harvest; yet the consequences are far more disastrous to the Blanc Sablonite should the rain continue for weeks at a stretch. In 1933 this sort of precarious drying extended from August to November.

Berry Picking

Berry picking in the hills at the back of the villages is engaged in by the women

and children of Blanc Sablon about the middle of August. The first berries to ripen are the bake-apple (*rubus chamaemorus*) and the plumboy (*rubus acaulis*), although the latter is not fully ripe until about the end of the month. Most other berries ripen considerably later. But berry picking is really a minor activity, and one in which the men do not generally participate. When the weather permits, the drying of the cod catch is the major activity—and in this even the women sometimes take part. The weather precluding all efforts of this nature, and there being no fishing possible—at least during August—the herring-nets are carefully examined and repaired for service during the following month.

DRYING COD ON THE " FLAKES "

DRYING OF COD

The cleaned and salted cod is left in the " stage " all through July and the first part of August. During the first fortnight of August, provided the weather is propitious, the " making " of fish begins. This operation consists of loading the salted cod on to wheelbarrows, carrying it to special puncheons filled with sea-water and washing and scrubbing it free of salt. It is then carried to the " flakes "—framework raised a short distance above the ground and covered with old nets. There it is spread out in the sun, where it becomes thoroughly dessicated and ready, finally, for market.

The celerity with which this operation is performed depends partly on the number and sizes of the " flakes," partly on the size of the catch, and last, but certainly not least, on the weather. Usually from one-and-a-half to two tons can be " made " in one day by one family. The " making " begins with sunrise and ends at sunset. The partly dried fish are then collected and piled into either circular or square heaps from four to five feet high and covered with sailcloth as

a precaution against rain. The next morning the fish are again placed on the "flakes" and given another day of drying. This process is repeated for about a week, by the end of which time the cod is almost entirely dry. It is stored for a few days, and then taken out for a final drying.

While the partially and completely dried cod is thus stored away, more fish is taken out of the "stage," washed clean of its salt and placed on the "flakes" until the whole season's catch has been disposed of. In 1933, in the instance of one family, the Pierre (Old Peter) Lavallée family, whose catch consisted of some twenty tons, these operations were engaged in throughout the entire month of August, and extended well into September. In all of such procedure an economic participation, similar to that already delineated, with each man having a specific task to fulfil, is obtained with only minor variations in the division of labour.

Herring-Fishing

Throughout the month of August, at night, or during stormy weather when the "making" of fish has to be postponed, the herring-nets are repaired in preparation for the herring, which come shoreward during September. The herring-net is a much finer fabrication than the cod trap-net. It is made of twine one thirty-second of an inch in thickness, and has meshes an inch and one-quarter square.

The herring are cleaned—that is, the entrails are removed—and salted away in barrels. But the profit made by herring-fishing is almost incredibly meagre, considering the time and the effort consumed in the activity, and thus herring-fishing must be looked upon as a minor occupation only, and virtually on a plane with berry picking ; for while the Hudson's Bay Company pays about four dollars a barrel for this fish, the cost of the herring-barrels—purchased from the Hudson's Bay Company—runs from two to two-and-a-half dollars apiece. Coarse salt, furthermore, averages about two dollars and seventy-five cents a hogshead. One instance where one family caught and salted twenty-five barrels of herring, clearing not more than twenty-five dollars for the lot, is rather noteworthy but not unique. Indeed, when the expense of net-repairing is added to the foregoing expenditures, it should not seem unusual that most Blanc Sablon men prefer to keep the herring as winter food for their dogs, rather than dispose of it through trade.

Wood-Gathering

The procuring of wood may be considered as one of the two primary or central activities of the Blanc Sablonites. The other activity, as we already know, is the cod industry. All the other and numerous activities are in the main subordinate and contributive to these two in the general, annual, socio-economic cycle.

With the appearance of the first snows the folk of Blanc Sablon engage in wood-gathering. The period of this activity extends roughly from the 15th to the 20th of October. But long before the first fall of snow—that is, about the end of September—the folk go from nine to ten miles inland and north-west of the

village to dig out the roots of certain stunted coniferous trees so common in the sparsely-wooded regions of the sub-arctic zone.

Small scrubby conifers grow in rocky depressions through which fresh-water streams flow bringing with them soil and silt—root-hold and nourishment in short—for such undersized vegetation. The groups are equipped with hatchets in order to clear away tantles of brush so that the roots may be reached and pulled out by hand. It is these roots that the folk desire. They are tough, gnarled, resinous and slow-burning—an effective fuel against the stinging, bitter, sub-zero blasts of winter. The majority of them are not much larger than twenty inches in circumference, with lengths not greater than six or eight feet, including part of the trunk above and below the ground. The work, which is gruelling and tedious, is made even more difficult by the ever-increasing distances the groups must travel from year to year.

After the roots have been dug out in this fashion they are piled in heaps until the first substantial snowfall, and then transported home on dog-drawn *cométiques*. Light snow is very important, for these heavily-laden vehicles could not be moved otherwise, and they are the only means that the folk have at their disposal for conveying the wood from the mountains down to the village. The roots are placed lengthwise between the horns of the *cométique* and roped tightly down. The dogs strain forward in their sealskin harness, and the men trudge beside the loads, keeping a vigilant look-out for sudden declivities, upon meeting which a chain-brake, made sometimes of rope, is thrown under the runners of the sled-like conveyance to keep it from toppling over. After the roots have been brought home, they are piled up behind the huts in cone-like heaps to be used subsequently for fuel.

The Dogs

The canine race is everywhere plentifully represented. From Havre St. Pierre (Pointe-aux-Esquimaux) on, every family possesses from five to as many as ten dogs. These animals are known as huskies—or Eskimo dogs; although one may encounter several varieties of these draught animals, some of them resembling the samoyed species, others not unlike the timberwolf. Most of the time they are left to shift for themselves, and this they do, feeding upon fresh fish debris thrown from the wharves during fish-cleaning operations. When this source fails them, they go in packs to the edge of the water where the capelin come to breed, and it is not at all uncommon to see them wading in the shallows with fresh capelin in their mouths. True scavengers are they, as is attested particularly by their feeding upon human fecal matter; but to this extreme they go only when the food of their more normal diet is scarce.

From October to April, and sometimes in May also, the dog-team—known in Canadian Labrador as *le cométique**—is the only means of travel between

* Borrowed from the Eskimo *Komatik*

communities. It is used also, as we have seen, for wood-gathering. The speed of such travel slightly exceeds summer water travel. Motor-driven and sailing vessels travel from seven to eight knots per hour ; a dog-team averages from eight to ten, provided the trail is not too rough.

The Eskimo dog, dog-harness and dog-shoes (made either of canvas or seal-hide to protect the animals' paws from sharp edges of snow and ice), the snow-goggles, sledge and leader-dog, and the language and clothing of the men—these are all clearly traits of the Eskimo dog-culture farther north, taken over and utilised by the French-Canadian *habitant* fisherman as well as the English-speaking *Liveyère.*

LABRADOR SLED-DOGS

The dogs are never allowed to enter the houses ; even the very young dogs have to remain outside whatever the weather, and usually sleep under the floorings or house-piles. The grown-up huskies curl themselves up at night in wind-protected depressions on the rocks. " Ugly " dogs only are kept chained. The animals otherwise run wild, and are able to engage unrestrained, consequently, in their scavenging activities. This takes the burden of their maintenance off the shoulders of the folk, who do not feed their dogs during the fishing season, being too busy to concern themselves with other than their own economic activities. The result of this is that the dog of Blanc Sablon early acquires stamina and the ability to take care of himself, even as the dog of the Eskimo.

The folk never lose sight of the dog's valuable rôle in their communal system. In summer, when the dog's service is not needed, the folk never forget to salt

away sufficient quantities of dogfish, salmon, and mackerel for his winter consumption, regardless of impending economic exigencies.

Trapping and Hunting

November ushers in trapping and hunting. The muskrat is hunted during the first week of November, and after that is not encountered until about the middle part of May. The same is true of the otter; for both these animals live in and around fresh-water accumulations which freeze over between November and May, forcing them to hibernate. This leaves only the fox and the weasel, and these are trapped continually throughout the winter. The marten, mink and mountain-cat are rarer here than around some of the rivers and streams lying west of Blanc Sablon. Steel traps, imported by the Hudson's Bay Company are generally used. The prices paid for furs are as follows: red fox, $15.00; silver fox (which is rare in this region), $50.00; weasel, .50; otter (rare), $23.00; and mink (rare also), from $27.00 to $28.00.

Sealing

Every year, during March, enormous masses of ice are brought down along the coasts of Labrador and Newfoundland by the Arctic, or Labrador, current. On these ice floes are thousands of seals, that have sought refuge and isolation for the purpose of rearing their young. In Newfoundland alone are many steamers and thousands of men all engaged during this time of year in the sealing industry. The vessels set out about March 12th, when the young seals are in the best of condition. Arrived at the grounds, the men make their way in among the ice floes with clubs, killing the animals by striking them on the throat—one of the few vulnerable spots on the body. Only the blubber and skins are carried away.

In Blanc Sablon this form of exploitation is carried on also—although in a much smaller measure, and with ordinary boats. The *habitant* fishermen, however, eat the flesh of the young seals, as well as utilising the blubber and skins. The reason for this is that the community suffers a perennial scarcity of fresh meat; and any change of diet, whenever possible, is consequently always welcomed.

The Blanc Sablon season for sealing is throughout May. By this time the young seals have found their fins, so to speak, and, having taken to the water, are caught with trap-nets set under the ice. Here, again, we have another instance of economic participation and co-operation; for the men hunt in family groups, and each group's interests are protected by markers set up on the shore to indicate where the nets are sunk.

The first operation, after the hides have been obtained, is called "scalping." The skins are first scraped clean of all fatty particles, for usually there is about one inch of fat adhering to the surface. Each skin is then washed in a mild solution of lye or soda.* Finally its sides are perforated, and it is stretched on special drying

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* Obtained from the Hudson's Bay Company.

frames, and secured by means of coarse net twine. During the sealing season one may see such frames exposed to the rays of the sun on the roof of almost every hut in Blanc Sablon. Four weeks of sun-drying generally suffices. The price, set by the Hudson's Bay Company, for skins treated in this manner ranges from 25 cents to 50 cents apiece; and the folk, who seldom if ever handle cash money, take their profit in food articles—canned goods and other necessities—just as in cod-fish trading.

Frost-drying is an alternative method of drying involving more labour and resorted to only when an absence of sunlight makes sun-drying impossible. The skins are left overnight on the frames to be acted on by frost, taken down in the morning, and the underside scraped again. The scraping is repeated twice in succession before the skins are considered clean. Frost-drying takes from one to two weeks; whereas sun-drying, the longer process, occupies anything from four to six weeks.

"Barking" or Tanning of Hides

In the "barking" or tanning of hides for leather several steps are necessary before the final product is reached. All fatty particles are first removed with a knife. The skin is next stretched on a frame similar to that used in sun-drying, and afterwards immersed in water with the hair side up for about three weeks, at which point the hair is scraped off by means of a rasp-file. A light salting follows; the skin is taken down from the frame and put into a "small pickle." It is then washed thoroughly in lukewarm water. Finally, it is stretched on a frame again for two more days. In this last drying care must be observed to keep the skin in the shade lest the sun turn the hide black. From this final product sealskin boots are made. The Hudson's Bay Company pays about two dollars and fifty cents for each tanned hide.

If there is no time for either curing or tanning when the seals are first caught, the green skins are heavily salted, folded and stored away until they can be taken care of.

Résumé of Annual Socio-Economic Cycle

Latter part of June to the end of July: cod-fishing and "making" of cod, with occasional sealing by trap-nets. August: advent of dogfish, end of cod-fishing, washing and drying of cod, repairing of herring-nets, berry-picking. September: herring-fishing, salting of cod, beginning of wood-gathering. October: wood-gathering with dog-teams. November (first week): muskrat and otter trapping. December to March: fox and weasel trapping. March: sealing on ice floes (although rare in Blanc Sablon). April to May: sealing by trap-nets, sealskin curing and sealhide "barking."

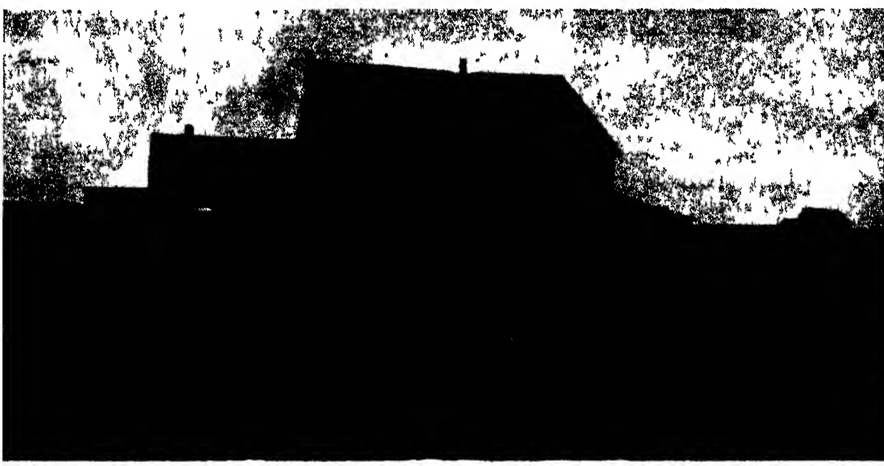
Houses

Twelve houses shelter Blanc Sablon, the entire population of which is

seventy-eight, not including three or four hired men who return to Newfoundland at the expiration of the fishing season. All the dwellings are constructed with pine boards brought in by water from Rimouski on the Gaspé peninsula. Most of these houses are little better than huts; not a few of them have only two rooms; and the majority of them no more than three.

For the purpose of illustration let us take the dwelling of Pierre (Old Peter) Lavallée, the head sibman of the group. This house is situated almost in the centre of the village, and is occupied by five people. It is erected directly on the rock and has, therefore, no cellar space. It consists of two large rooms, two cubicle-like rooms, an attic and a pantry or outside-room.

We enter through the outside-room, the dimensions of which are about five feet



A Typical Labrador Fisherman's House

by five, and which is used mainly for water-storage purposes. All doors approximate five feet five inches in height, a quite common measurement since the Blanc Sablonites are small in stature. Passing into the house from the pantry we come upon a combination kitchen and living-room, about twelve feet square. In this room are to be found an iron stove and three plain, home-made benches, two of which are set under the two windows. At the back of the stove are two ladder-like racks fastened to the wall and used for the drying of wet woollen socks. Occupying the remaining space are two factory-made chairs, a rough home-made meal table, a home-made cupboard, and a home-made side-table with a drawer. There is no ceiling in this room, and the bare roof, consequently, is exposed.

The walls of the kitchen are partially covered, sometimes with a cheap, yellow paper, sometimes with newspaper, to make them less draughty; but the two-by-four uprights, which have been whitewashed, are fully exposed. This room has three doors: the one through which we entered; another, directly opposite, leading

into a small store room, five feet by five; and a third, to the right as we enter, which leads into the middle and more pretentious room looked upon as the parlour. All the doors have wooden handles with wooden latches—in Blanc Sablon no locks or keys are used. It is in this room that the entire Pierre (Old Peter) Lavallée family congregates—that is, Old Peter, his wife Mary, his brother Ernest, and his two unmarried sons, Donald and Manuel. And here also all the meals are cooked and eaten, except on Sundays, when the whole family gathers solemnly in the middle room.

The middle room has the same dimensions as the kitchen. It has two entrances, one from the kitchen and one from the front, and also access to the attic *via* a back staircase. Two other and smaller doors lead into two cubicles, one of which is used as the government post office of the community—and operated by "Aunt" Mary—and the other as a bedroom. The middle room has two windows like the kitchen, and since the attic is overhead, it has a ceiling (forming the floor of the attic) six and three-quarter feet from the floor, and made of four-inch boards painted white.

In this room is also an old aluminium-painted range, fired only on Sundays or during the colder days of the winter; its estimated age is seventy-five years. An aged and scarred Newfoundland table made of soft wood and with drop leaves, occupies a place near one of the windows. A smaller thin-legged home-made table, eighteen inches by thirty-six, stands near the entrance to the kitchen; it has been painted green, and on it are a small linoleum mat and four potted plants (geraniums, and a certain sub-species of rose) in old lard cans. Against the wall a wooden home-made sofa has been placed. Its style is *à la Madame Récamier* (a style quite common in many *habitant* homes). Loose rag padding and a cushion for body and head comfort supply the place of upholstery. The windows—seldom, if ever, opened, as we have said, judging from the airtight sashing (an arrangement which precludes any proper ventilating)—are draped with lace curtains possessing geometrical designs and attesting "Aunt" Mary's solicitous attempts to metamorphose this otherwise bare structure into a home. Twelve pictures—mainly lithographs of a religious nature—adorn the walls of the room.

We shall pass over the attic; it contains only some roughly-made pallets, and is used as sleeping quarters for the four men; two small windows, one at each end, but never opened, supply a meagre light for the men to dress by in the morning.

The cubicles have already been mentioned. Each has a double window. One of the cubicles has been converted into a bedroom, and is used by "Aunt" Mary. This contains a small metal bed, about five feet in length, a small home-made bureau with two drawers, and a home-made washstand with one drawer. The bed fills almost the entire space. Some room, however, has been found for a small old-fashioned factory-made trunk and a home-made rocking-chair. This cubicle has wallpaper with a flower design. The door, painted with grey boat-paint and provided with a wooden latch, is kept open, perforce, because it is so badly

warped. Here, again, as in the middle room, are pictures of religious subjects, seven in number.

We have been dealing here in detail essentially with the house of Pierre (Old Peter) Lavallée, the patriarchal head sibman of Blanc Sablon.* The majority of the houses of the village, however, are much less ornate in comparison, and may well be said to satisfy only the elementary need for shelter. In winter the wind roars through them, shaking them to their foundations; and any water brought inside freezes solid, unless kept close to the stove. In summer, spring and fall they are at the mercy of every rainstorm.

(The concluding part of this paper will be published in a subsequent number of the JOURNAL.)

NOTES ON BOOKS

THE OLD HALLS AND MANOR-HOUSES OF NORTHAMPTONSHIRE. By J. A. Gotch. London: B. T. Batsford Ltd. *21s.*

Mr. Gotch himself lives in Northamptonshire, a county eminent for its architectural splendours. These consist partly of Gothic churches belonging to all the phases of the style, and partly of halls and manors. An exceptional number of these date from the sixteenth century, the vigorous age of transition from Gothic to Renaissance. The interest of Mr. Gotch's book is enhanced by this fact.

The lingering twilight of Gothic saw the building in many parts of England of houses, churches and colleges of a kind that was at once fantastic and inspired. Gothic became sophisticated—or if one likes to put it another way, the classical style had not had time to become academic. As far as Northamptonshire was concerned, it so happened that several of Queen Elizabeth's most eminent statesmen " had hereditary connections with the county and built themselves fine houses within it. To mention only a few, there were the Cecils at Burghley, the Mildmays at Apethorpe, the Hattons at Holdenby, the Spencers at Althorp, the Comptons at Castle Ashby." The list is much longer than this. And not only did the great build, " even for yeomen and the peasantry houses sprang up designed with architectural feeling." It was architectural feeling, it was also a bold, imaginative feeling; the builders brought no discredit on Shakespeare, their noblest contemporary.

It is not improbable that the eminent and mysterious Thorpe had a hand in Burghley House. Though Mr. Gilpin did not approve of it, because of its un-Grecian massiveness and variety, he was forced to admit that " it has still an august appearance." Of this, readers can judge for themselves from Mr. Gotch's photographs. Apethorpe has an East front reminiscent of St. John's, Oxford; less perfect, because of the broken line of the roof, it is richer, more seigniorial. The quiet dignity of these early seventeenth-century houses has no parallel. Drayton House, an earlier building, " has never been sold nor alienated nor let to a tenant."

* It was in this house that the author lived during his stay in Labrador.

For six hundred years it has descended by inheritance or gift. It is an extraordinary, though not quite a unique, record.

The eighteenth century is excellently represented in Northamptonshire. The large, suave Boughton House, with its civil mansard roof, dates from the reign of Henry VIII, but what one sees was built about 1700. Hawksmoor and Webb worked in the county, superb architects, but not as homely as some of their lesser known or unknown predecessors.

Mr. Gotch was the right man to deal with this subject, and he has done so to admiration. It is a fine book.

SCOTT OF THE SHAN HILLS. Edited by G. E. Mitton (Lady Scott). London: John Murray. 15*s*. net.

Like many of our Empire builders, James George Scott was a son of the manse. His father was minister of Dairsie, a small village in Fife, where George was born, but at an early age, on the death of his father, he was taken to Germany to be educated there and subsequently at King's College School and Lincoln College, Oxford. His Oxford career, however, was prematurely cut short, thanks to the well-intentioned but over-optimistic zeal of a relative, who, instead of making a fortune for Mrs. Scott, lost the bulk of her property, with the result that George was suddenly compelled to fend for himself. The call of the East and a life of adventure had an irresistible appeal for him, and he left Lincoln to proceed as a special correspondent of the *Standard* in Perak. For the next five-and-thirty years Scott's life was to be spent almost continuously in the jungles of Perak and the Shan States. The Shan Hills, after the annexation of Burma, were teeming with dacoits and brigands. Scott had an intensely sympathetic understanding of the native mind, and a way with him that was irresistible—so much so that instead of having to rely on force to overawe these unruly rascals, he soon had his Burmese lads playing football and cricket, and ready, if need be, to follow him to the death.

In the course of time it became known in high circles that Scott's knowledge of Burma, Siam and the neighbouring parts was unique, and he was appointed a member of the first Anglo-Chinese Boundary Commission. The problems arising in the course of this work were naturally many and delicate; but Scott always contrived to find a solution satisfactory to both parties, and his masterly handling of the whole business was recognised by the award of the K.C.I.E.

Fortunately Scott kept fairly full diaries of his journeys and doings. Lady Scott (whose literary skill is well known in connexion with her pen-name "G. E. Mitton") has made these speak for themselves, only inserting enough of her own material to provide a consecutive narrative. She has also reproduced some of the numberless photographs taken by her husband—an art in which his enthusiasm was only equalled by his success.

The proud title of "Scott of the Shan Hills" is fully justified, for surely no Western mind was ever more closely in touch with the psychology of the East, or did more for the wild country of the Shans and the head-hunting Wa, than Sir George Scott. An admirable account of the Shan States was given by him in a paper which he read before the Royal Society of Arts in April, 1905, and for which he received the Society's silver medal. G.K.M.

PHOTOGRAPHY AND THE ART OF SEEING. By M. Natkin. London: the Fountain Press. 10*s*. 6*d*.

"Some writers," says Mr. Natkin, "declare that the photographer must be

a skilled physicist and an expert in optics and mechanics. I do not agree." Nor do we. There are always "some writers" to advance preposterous theories about anything.

The great fact about cameras is that they give a huge amount of pleasure to young and old all over the world. They are also "useful." One can win prizes of £2 10s. with them—and even larger sums. Indeed, one can earn a living by means of them, as no doubt most of the contributors to Mr. Natkin's book do. These samples of their work have at least two things in common: they are efficient, and they are peaceable. We must not forget that the camera, like the ploughshare, can be beaten into a sword.

Mr. Natkin's aim in making the choice he has done is to guide his readers "in artistic matters." And he goes on to make an admirable remark. He says: "The artistic quality of a photograph is a function of the art of seeing." The art of seeing is the essence of much fine painting, and it was to emphasize its importance that Oscar Wilde said: "Nature imitates art." If using a camera teaches us to see, then it does more for us than provide good negatives and positives. Further, the camera has undoubtedly helped to reveal to its manipulators angles of vision which painters either neglected or failed altogether to observe. Some of these angles have little æsthetic value, and yet a certain humour or whimsical validity. Man Ray's excellent nude facing page 60 is a painter's subject, M. Goursat's gondolas facing page 44 are not, nor is M. Vadas' train (24).

The photographs are good. They will be sure to make some people want to raise their own standard of photography. Now, how far does Mr. Natkin give them any help in his text?

Perhaps his chief merit is giving moral support to those who are prepared to show that shapes, irrespective of sentimental content, make an interesting subject. As an example, the author gives a ball of string by Sougez. Next he approves the vogue for what the Germans call "Heimat Photographie"—homely realism, over which painters trip, but which is a clear field for photographers. Then there is realism of the less homely kind. This is too sensational for painting, but it "comes off" when the camera deals with it intelligently.

The best chosen illustrations are perhaps M. Kollar's head of a man and M. Sougez' figure of a girl. They prove that photography really is good for portraiture. Indeed, Mrs. Cameron proved it half a century ago, but the illustrated papers and the windows in the West End are so full of tenth-rate photographic portraits (tenth-rate in spite of their technical skill) that many people must be disenchanted with this branch of the art. In a word, Mr. Natkin's book is sound and sensible. P.B.

GENERAL NOTE

THE TWENTY-SIXTH ENGLISHWOMAN EXHIBITION OF ARTS AND CRAFTS.—This well-known exhibition will this year be opened by H.R.H. the Duchess of Gloucester, on Wednesday, November 11th, at the Central Hall, Westminster, and will remain open until Saturday, November 21st (11 a.m. to 7 p.m. each day). The exhibition will include almost every description of arts and crafts and offers an admirable opportunity for purchasing very attractive Christmas presents at reasonable prices.

MEETINGS OF OTHER SOCIETIES DURING THE ENSUING WEEK

MONDAY, NOVEMBER 9..Brewing, Institute of, at the Horse Shoe Hotel, Tottenham Court Road, W. 6 p.m. J. A. Burns, "**Yeast Flocculation.**"

Electrical Engineers, Institution of, Savoy Place, W.C. 7 p.m. Discussion on "**The Relative Costs of Electrification of Rural and Urban Areas.**" (Opened by J. A. Sumner.)

At Armstrong College, **Newcastle-on-Tyne.** 7 p.m. L. H. Harris, E. H. Jolley and F. O. Morrell, "**Recent Developments in Telegraph Transmission, and their Application to the British Telegraph Services.**"

At the South Wales Institute of Engineers, **Cardiff.** 6 p.m. L. H. A. Carr, "**Recent Progress in Induction—Motor Construction.**"

Geographical Society, Royal, Kensington Gore, S.W. 5 p.m. N. E. Odell, "**The Glaciers and Morphology of the Franz Josef Fjord.**"

Metals, Institute of, at 39 Elmbank Crescent, **Glasgow.** 7.30 p.m. W. R. Barclay, "**The Nickel Industry—Some Recollections.**"

Psychological Society, British, 55 Russell Square, W.C. 6 p.m. Miss E. M. Nevill, "**Problems of the Brilliant Child.**"

University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Don F. Sánchez Cantón, "**Six Great Spanish Artists. Lecture IV—Juan de Herrera, Arquitecto.**" (In Spanish.)

At the London School of Economics, Houghton Street, W.C. 6 p.m. P. A. Wilson, "**Current Problems of Business Administration. Lecture II—The Administration Chart.**"

At King's College, Strand, W.C. 5.30 p.m. Prof. Dr. R. W. Seton-Watson, "**Austria, the Habsburgs and the Empire. Lecture V—Transition: from the Jesuits to 'Enlightenment.'**"

At University College, Gower Street, W.C. 5 p.m. Dr. R. J. Lythgoe, "**The Physiology of Vision.**" (Lecture V.)

5.30 p.m. Prof. Dr. W. Starkie, "**Adventurers in Literature and Music.**" (Lecture I.)

TUESDAY, NOVEMBER 10..Civil Engineers, Institution of, Great George Street, S.W. 6 p.m. F. C. Cook, "**Road Design and Road Safety.**"

East India Association, at Caxton Hall, S.W. 4.30 p.m. Sir G. Anderson, "**Secondary Education in India: Rural Reconstruction and Unemployment.**"

Electrical Engineers, Institution of, at the Hotel Metropole, **Leeds.** 7 p.m. L. H. Harris, E. H. Jolley and F. O. Morrell, "**Recent Developments in Telegraph Transmission, and their Application to the British Telegraph Services.**"

Illuminating Engineering Society, at the Institution of Mechanical Engineers, Storey's Gate, S.W. 7 p.m. E. W. Murray, "**Factory Lighting and Accident Prevention.**" (Joint meeting with the Institution of Engineers-in-Charge.)

Manchester Geographical Society, 16 St. Mary's Parsonage. 7.30 p.m. Miss O. Lodge, "**Jugoslavia, the Land of the South Slavs or Serbs, Croats and Slovenes.**"

Marine Engineers, Institute of, 85 The Minories, E.C. J. Hendry, "**Air and Gas Compressors.**"

Metals, Institute of, at Armstrong College, **Newcastle-on-Tyne.** 7.30 p.m. M. Milbourn, "**Spectrographic Analysis of Metals.**"

At the Y.M.C.A., **Swansea.** 6.30 p.m. Dr. C. J. Smithells, "**Gases and Metals.**"

Petroleum Technologists, Institution of, at the Royal Society of Arts. 5.30 p.m. **Symposium on Geophysics.**

Sanitary Institute, Royal, 90 Buckingham Palace Road, S.W. 5.30 p.m. Lt.-Col. G. Leighton, "**The Supervision of the Nation's Food Supply.**"

University of London, at King's College, Strand, W.C. 5.30 p.m. Prof. G. Florovsky, "**Patristic Doctrine of Atonement.**" (Lecture II.)

5.30 p.m. Dr. W. J. Rose, "**The Cities of Poland: Their Rise and their Significance for the New State. Lecture III—Warsaw: The City of Chopin and Sienkiewicz.**"

At the Royal School of Mines, Prince Consort Road, S.W. 5.15 p.m. P. Rabone, "**Modern Methods of Flotation. Lecture I—Flotation Machines.**"

At University College, Gower Street, W.C. 5.30 p.m. Miss E. J. Davis, "**Re-plannings of London, c. 1520-1930.**" (Lecture I.)

WEDNESDAY, NOVEMBER 11..Diesel Engine Users' Association, at Caxton Hall. S.W. 4.45 p.m. T. Hornbuckle, "**The Application of Diesel Engines to Rail Traction.**"

Electrical Engineers, Institution of, at the Municipal College, **Portsmouth.** 7.30 p.m. J. S. Forrest, "**The Electrical Characteristics of 132-kV Line Insulators under Various Weather Conditions.**"

Heating and Ventilating Engineers, Institution of, at 95 New Street, **Birmingham.** 6.45 p.m. E. L. Joselin, "**Air Conditioning with reference to Industrial Work.**"

Horological Institute, British, 35 Northampton Square, E.C. 7 p.m. L. H. Bonnaire, "**Modern Methods in Swiss Watch Production.**"

Literature, Royal Society of, 2 Bloomsbury Square, W.C. 5 p.m. Prof. J. Drinkwater, "**Occasional Poetry.**"

Physics, Institute of, at the Royal Institution, Albemarle Street, W. 8 p.m. L. C. Nickolls, "**Physics and the Detection of Crime.**"

United Service Institution, Royal, Whitehall, S.W. 3 p.m. Sir A. Hurd, "**British Merchant Shipping To-day.**"

University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Don. F. Sánchez Cantón, "**Six Great Spanish Artists. Lecture V—Juan Martinez Montanés, Escultor.**" (In Spanish.)

At King's College, Strand, W.C. 5.30 p.m. Dr. Helen Rosenau, "**The Influence of Religion on Architecture. Lecture V.—The Synagogue.**"

5.30 p.m. G. Struve, "**Pushkin and the Golden Age of Russian Literature. Lecture II—Zhukovsky and Batyushkov as Founders of Modern Russian Poetry and Pushkin's Predecessors.**"

At University College, Gower Street W.C. 5.15 p.m. Prof. Sir M. Amos, "**Select Topics in Comparative Civil Law.**" (Lecture V.)

THURSDAY, NOVEMBER 12..Asiatic Society, Royal, 74 Grosvenor Street, W. 4.30 p.m. Dr. S. Daiches, "**The Meaning of Sacrifices in the Psalms.**"

Aeronautical Society, Royal, at the Royal Society of Arts. 6.30 p.m. Dr. F. W. Lanchester, "**The Part Played by Skin Friction in Aeronautics.**"

Civil Engineers, Institution of, at the James Watt Institute, **Birmingham.** 6 p.m. R. C. Whitehead, "**Purification of Public Water Supplies.**"

Electrical Engineers, Institution of, at University College, **Dundee.** 7.30 p.m. A. E. Crawley, "**Magnetic Separation.**"

Fuel, Institute of, at the Chemical Society, Burlington House, W. 6 p.m. Dr. J. S. Clarke, "**Applications of Practical Thermodynamics.**"

Geffrye Museum, Kingsland Road, E. 7.30 p.m. H. W. Wilson, "**Good Craftsmanship in Lettering.**"

Historical Society, Royal, 22 Russell Square, W.C. 5 p.m. N. Denholm-Young, "**Richard de Bury.**"

Mechanical Engineers, Institution of, at the Technical College, **Derby.** 7 p.m. F. E. Smith, "**Plant for the Production of Petrol by the Hydrogenation of Bituminous Coal.**" (Joint Meeting with the Institute of Fuel.)

At the Hotel Metropole, **Leeds.** 7.30 p.m. G. L. Murray, "**Colour Control for Machine Tools.**"

Metals, Institute of, at the Royal School of Mines, South Kensington, S.W. 7.30 p.m. Dr. W. H. Hatfield, "**Research in the Iron and Steel Industry.**"

Royal Society, Burlington House, W. 11 a.m. Discussion on "**Chemical and Physical Basis of Pharmacological Action,**" opened by Prof. H. J. Clarke.

Science Guild, British, at the Goldsmiths' Hall, Foster Lane, E.C. 4.30 p.m. Lord Rutherford, "**Science in Development.**"

University of London, at King's College, Strand, W.C. 5.30 p.m. Mrs. H. S. M. Amburger-Stuart, "**Some Aspects of National Music. Lecture V—The Development of German Song.**"
5.30 p.m. Dr. S. J. Davies, "**Injection and Combustion in Oil Engines.**" (Lecture V.)
5.30 p.m. Prof. G. Florovsky, "**Patristic Doctrine of Atonement.**" (Lecture III.)

FRIDAY, NOVEMBER 13..Chemical Industry, Society of (Chemical Engineering Group), at the Institution of Civil Engineers, Great George Street, W. 6 p.m. Dr. J. W. Mellor, "**Refractories.**"

Mechanical Engineers, Institution of, Storey's Gate, S.W. 7 p.m. T. F. Davey, "**The Production of Oil from Submarine Fields.**"

Metals, Institute of, at the University, St. George's Square, **Sheffield.** 7.30 p.m. L. B. Williams, "**Lead Mining in Derbyshire.**"

Royal Institution, 21 Albemarle Street, W. 9 p.m. Very Rev. Dr. D. H. S. Cranage, "**Monastic Life and Buildings in the Middle Ages.**"

University of London, at the Courtauld Institute of Art, Portman Square, W. 5.30 p.m. Don F. Sánchez Cantón, "**Six Great Spanish Artists. Lecture VI—Alonso Cano, Escultor, Pintor y Arquitecto.**" (In Spanish.)

At the London School of Economics, Houghton Street, W.C. 5 p.m. R. Olden, "**Rise and Decline of Liberalism in Germany (1808–1933). Lecture I—From Stein's Reforms in 1808 to the Karlsbad Decrees.**"

At King's College, Strand, W.C. 5.30 p.m. J. Chardonne, "**L'amour Conjugal dans le Roman Français.**" (In French.)

SATURDAY, NOVEMBER 14..Horniman Museum, Forest Hill, S.E. 3.30 p.m. Miss I. D. Thornley, "**Parents and Children in the Middle Ages.**"

EXHIBITIONS DURING THE ENSUING WEEK

MONDAY, NOVEMBER 9..(TO NOVEMBER 14) **Ideal Home, Food and Fashion Exhibition, Edinburgh.**

(TO NOVEMBER 15) **Exhibition of Everyday Things,** Art Gallery, **Manchester.**

(TO NOVEMBER 16) "**Sunday Times**" **Book Exhibition,** Dorland Hall.

(TO NOVEMBER 28) **Exhibition of Inn Signs,** 158 New Bond Street, W.

WEDNESDAY, NOVEMBER 11..(TO NOVEMBER 13) **Silver Fox Exhibition,** Agricultural Hall.

(TO NOVEMBER 21) **Englishwoman Exhibition of Arts and Crafts,** Central Hall, Westminster.

FRIDAY, NOVEMBER 13..(TO NOVEMBER 21) **Scottish Motor Show, Glasgow.**

INDEX TO VOL. LXXXIV